PUBLIC WORKS

Devoted to the interests of the engineers and technical officials of the cities, counties and states

JULY, 1938

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TIMEWASTERS

Getting harder than ever to find any time to waste, these days, what with extra work, getting ready to go to camp for a tour of duty with the reserves, mowing the lawn that we fertilized with some good sewage sludge (and how that grass grows), and delving into this, that and the other thing. But, now to start on last month's teasers:

The number ending with "2" that doubles when the "2" is moved to the left side of the number is quite a number. It can be solved by algebra, or just by multiplying, beginning 2 x 2 and keeping on until you reach 2 x 0. All by itself, the answer is 105,263,157,894,736,842.

The reversible number is 432. Subtract one-fourth and you have 324; again subtract one-fourth and you have 243.

The ladder problem, as stated, was a little difficult, but the alley is 11.5326 ft. wide. The fact that *ab, bc, cd* and *ad* are all whole numbers simplifies the solution greatly.

Dumb and Dora:

Says Dumb: "I am 28 years old; how old are you?" Dora: "Four years before I was born, you were twice as old as I was when you were five years younger than I am now." How old is Dora, asks *John Bevan.*

The Old Swimming Pool:

A man had a pool on his land in which waterlilies grew. He wanted to find the depth of the water, but had no boat in which to get out and take soundings. He brought out his trusty transit and sighted on a waterlily which had its roots in the bottom and its blossom exactly one foot above the surface. The next day, a strong wind was blowing which brought the blossom exactly to the surface of the water at a point six feet from where it stood previously. Assuming that the stem bent only at the bottom, so that it remained straight throughout its length, what was the depth of the pool at that point? And if you want to make two problems out of this, what would have been the depth if the stem bent in a uniform curve, other conditions being the same? Thanks to *Johns-Manville.* *W. A. H.*

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When you need special information—consult the *classified* READERS' SERVICE DEPT., pages 55-57

PUBLIC WORKS
City, County and State Engineering and Construction

JULY, 1938
VOL. 69. NO. 7

PWA and WPA

Information on acceptable projects; bases for grants, loans and other assistance; how and where to apply

SPEED is the essence of the new PWA program. Its purpose, and the purpose of the WPA, is to create employment quickly. For the PWA, Congress has authorized $965,000,000 to be expended on useful public works; local communities must raise 55% of the cash, and the PWA will contribute 45%. It is estimated that total expenditures will be $1,800,000,000.

Methods and procedure under the WPA are explained quite fully in the article following this one; PWA procedure will be outlined briefly here.

Types of Projects.—The general policy that has prevailed in the past as to types of projects will continue to be followed. The projects should be useful, of benefit to the community and preferably of such nature as to benefit heavy industry. Water works projects; street, highway and bridge construction; sewers and sewage treatment; and waste disposal are of a broadly beneficial nature and represent the principal places where the money spent can earn its own way.

Receiving Applications.—Applications will be received during the months of July, August and September only: no applications will be accepted that are made after Sept. 30 of this year. Work must begin before Jan. 1, 1939, and must be completed by June 30, 1940. Promptness and speed are therefore necessary in preparing and making applications.

Offices have been opened by the PWA in all principal cities. (The address of the office nearest you will be sent on request to PUBLIC WORKS.) In each office is stationed an engineer whose sole duty is to help jobs get started quickly. Other engineers are available for advice and assistance in working up the necessary data on projects.

Grants and Loans.—Grants will be made for 45% of the cost. Loans also are available to aid in financing the work. Conditions are essentially the same as on former PWA projects.

Plans and Data Required.—Preliminary plans with estimate of cost by the engineer or architect are required for consideration. Such plans should be sufficient to indicate clearly the scope of the work and to afford a reasonably good estimate of its probable cost. Applications need not wait on detailed plans. An engineer's report outlining the proposed work should accompany the preliminary plans and estimates. Those projects which require approval by the state, as water works, sewerage, dams and buildings, must be so approved before the allotment is made.

In most all the states, there is close cooperation in this regard, so that no holdup will result from delay of State approval; and in many States, an engineer has been assigned to the PWA office for the sole purpose of assisting on such work.

Where the State laws so require, plans must be prepared by a licensed engineer.

Time Required.—Every effort is being made to expedite the approval of the projects. While most of the projects to which money already has been alloted are from the lists of projects previously approved (2 years ago) but not granted funds then because of lack of money, speed is the mainspring of the present program and every effort is being made to approve new projects quickly and allot funds at once. We are informed that some projects in Region No. 1 (which includes the northeastern part of the country) were approved in 3 or 4 days after being presented, and that bids on some of these are now being called for.

Some Desirable Types of Projects

Water Works Improvements.—Of all the investments a community can make probably none returns its cost so quickly as water works. There is a constant income from the sale of water. In the case of a new system, the reduced cost to the community due to the 45% grant, and to the low interest rate on the remainder, make it possible for nearly every community to have its own water supply, with water rates at a most reasonable level. For such communities as do not now have a supply, the present offers such a remarkable opportunity for obtaining one, that there should be no delay. Reduction in fire insurance rates alone may equal the carrying costs of the system, exclusive of income from sale of water.

Main extensions, by reaching new customers, bring in added revenue, and also reduce fire insurance costs in the areas served. Larger lines or new pumps may reduce the cost of pumping, or a wholly new supply may eliminate the need for pumping; an elevated tank may improve pressure; more storage may provide additional needed fire protection.

Hard water can be softened, or iron removed, usually

resulting in increased use of the water and added satisfaction on the part of the consumers. Taste and odor removal or control is highly appreciated by the voters and taxpayers.

Safe water is, of course, essential: Chlorination; filtration; sedimentation; coagulation: any or all of these furnish a desirable project.

Swimming Pools.—There are few things that a city can do that is more appreciated by children and by their parents than a safe swimming pool. Moreover, the cost of operation can be met by a small charge to users, so that the project does not represent any continuing drain on the local finances.

Street and Highway Construction.—Proper construction and drainage of streets and highways, and modern surfacing, greatly reduce maintenance costs and increase property values.

Proper drainage is the first essential. Both surface and subsurface water must be controlled, and when this is done, maintenance costs are thereafter greatly reduced.

Surface treatment can be employed to smooth up and modernize irregular and broken surfaces; old brick pavements can be relaid; heavy-duty wearing surfaces of concrete, road-mix, plant-mix or other types can be laid which will give many years of service with minimum maintenance.

Narrow bridges can be widened or replaced with modern culverts, if the span is not too great, thus greatly increasing highway safety. By-pass roads; widening; and straightening are other desirable projects. Sidewalks are needed along streets in many populated areas, and their construction is a safeguard for the pedestrian.

Sewerage and Waste Disposal.—The proper disposal of sewage and waste is a first essential requirement of government, because improper disposal may cause disease, nuisance and inconvenience. For the community which has a water supply, or is planning one, a system of sewers, with proper treatment and disposal of the waste, is necessary; if not provided now, it must be provided soon, when perhaps the cost to the community will be much greater.

Disease-producing bacteria do not recognize man-made boundaries or limits; no community is truly sanitated unless it is *all* sanitated. To provide sewer facilities in one area, but not in another, is a convenience to the sewered area, but not a health protection. Sewer extensions can do a complete job of both convenience and health protection.

Garbage disposal, properly done, is also a powerful factor in health and convenience. Dumping of garbage is not a method of disposal; it is an evasion and delusion, tolerated in the face of continual complaints, generally until these become too vociferous. Incineration is a sanitary method of disposal.

On the opposite page is presented a check list. PUBLIC WORKS will help you in every way possible, if you wish. Check the items you want help or information on and send to us, with a letter explaining your problems and desires in as much detail as you can.

Procedure for Submitting WPA Projects

By OLNEY BORDEN

THE WPA has now been operating for three years in most sections of the U. S., but it seems that there are still some local governmental units that do not know the procedure for submitting a project. This procedure, which has not varied to any marked degree in the three years of the WPA, is as follows:

The Sponsor of a project must be a taxable unit such as a Town, Village, City, County School District, Water or Sewer District, or any other unit of government which raises its funds by tax. A representative of the Sponsor that wishes to submit a project should contact the local WPA office (which is usually located in the County Seat of each County) and make known his plans for this project to the Superintendent of Construction who has charge in the local offices. The Superintendent will aid him in preparing a project proposal to the extent of writing out these forms for him providing the Sponsor furnishes the necessary plans, specifications and cost estimates for the work contemplated. The local WPA man will also notify the Sponsor whether or not his particular project will require a complete set of plans or whether rough sketches only will suffice. Another advantage of going to the local offices first is that thus the Sponsor can learn the number of local men available in the various labor classifications, which information may be valuable in planning certain types of work. For example: Where several stone masons are available on relief, but no cement masons and carpenters, it would be desirable to design a laid-up stone wall rather than a cement wall.

The WPA officials, from the county offices up to the State Directors, are becoming more insistent that adequate plans be submitted with the project proposal. These plans must be prepared by licensed engineers wherever the State laws require, the same as any private work. For example, the WPA will not accept a project for any sewage disposal work on water works unless this proposal is accompanied by plans and specifications approved by the State Board of Health. In New York State one man in the State Board of Health office does nothing else but check WPA proposals to see if they meet with all State laws. The same procedure applies to building projects, dams or any other work that is directly under State supervision. In the rural communities the majority of the projects are for road improvement. The WPA has not insisted that the Sponsors furnish plans for this work for the reason that the towns never have made plans for their own work and there is no harm done to the engineering profession, therefore, by accepting these projects.

Better types of roads are being submitted each year. Many town roads are now being built at a cost of $8,000 to $10,000 a mile with practically no engineering service and it is a matter of debate whether WPA should refuse such projects unless proper plans are submitted with them, or whether engineers are lax in selling their services to the sponsors to the extent of showing them how much better a road they could build with a reasonable amount of engineering work and for possibly very little or no extra cost. This question probably will be decided before too many of these projects are submitted.

The WPA engineers do make suggestions for improving the types of road projects submitted and also make suggestions as the work progresses, but no WPA official is allowed to make any charges for assisting a Sponsor to prepare a project or suggestions for carrying on the work.

The WPA is now accepting projects in the construction group for: roads, water works, sewage disposal and

sewers, sidewalks, buildings, streets, parks, playgrounds athletic fields, and, in fact, almost any kind of public improvements. They will not accept projects which are distinctly maintenance work for which the Sponsor normally appropriates funds yearly, such as brush cutting, street cleaning, patching roads and streets, etc. There are also a large variety of projects being accepted in the white collar group, but these are generally out of the field of engineers and engineering.

The WPA, in accordance with the practice of the past year, will pay for all the relief labor on the project at the rate specified for the locality and the labor classification, and also for supervisory personnel on the project providing it does not exceed 5% of the relief labor. The foremen and superintendents on the projects do not necessarily have to be relief persons but are chosen by the WPA from lists of men qualified to do this work. The WPA will pay for all the skilled and intermediate workers who are available on the relief rolls and who can quality for the class of labor required. They do insist that the Sponsor furnish whatever skilled labor is required to carry on the project that is not available on the relief rolls.

The WPA will rent or buy equipment or buy material for use on a project to the extent of $5. per man-month of relief labor furnished on the project. This rule will not apply on projects where there is a large amount of labor and very little material or equipment so that the Sponsor does not have to furnish anything. The Sponsor should plan on doing his share towards carrying on the program and not expect the WPA to furnish the entire cost of any projects.

It is not necessary that there be enough relief workers available in any one town, village or city. It is possible to transport workers from one locality to another. In the rural areas several towns join together to make a good workable gang and these move from one town to another, completing one project for each town in turn. This practice works very well, as there are a number of small communities that could not work their equipment economically with the limited number of men they have in their particular community. The WPA also insists that there be sufficient men on every project to operate it economically or else they will close down the project.

It is possible and many times good business to submit a certain program of work by a number of projects. A superseding project can be written after a project has been started, adding on extra work not set up in the original project. For example, if a sewer district has been formed and it is desired to submit a WPA project to construct the sewer lines and manholes pending the final choice of building the disposal plant by contract or by WPA work. If at any date after the sewer project has been submitted the Sponsor wants to add the construction of the disposal plant to the project, this can be done by writing a superseding project including all the sewer work and the plant also; or else by submitting a separate project for the disposal plant. Either way, any additional work will have to have the proper plans for the extra work the same as any other project. The Sponsor also has the right to stop work on the project at any time he so desires and continue the work by contract or day labor or any other way he desires.

The time required for the approval of a project is usually from six weeks to two months, depending on the type of project. If the Sponsor furnishes all the information requested at the local office of the WPA, his project will probably be ready for operation within two months. A good share of this time is taken up in the mails between local office, district office, state office and then to Washington for Presidential approval and back through the same channels. There are certain items to be checked in each of these offices, and in addition, on projects which come under State supervision such as sewers, buildings, etc., they must be checked by the proper State authorities before they can go to Washington for approval.

Check in the list below any items on which you wish help or information from *Public Works*.

----------NEED INFORMATION? USE THIS FORM----------

PWA-WPA Dept.,
PUBLIC WORKS
310 East 45th St., New York, N. Y.

I want information on how to proceed with a proposed PWA or WPA project on the items checked below:

WATER SUPPLY	HIGHWAYS & STREETS	SEWERAGE AND WASTE DISPOSAL
☐ New Supply	☐ Subdrainage	☐ Sewer System
☐ Laying Mains	☐ Surface Treatment	☐ Sewer Extensions
☐ Elevated Tanks	☐ Penetration Macadam	☐ Chlorination
☐ Chlorination	☐ Road-Mix	☐ Trickling Filter
☐ Taste Removal	☐ Plant Mix	☐ New Settling Tank
☐ Water Softening	☐ Brick	☐ Sludge Digestion
☐ Iron Removal	☐ Portland Cement Concrete	☐ Sludge Disposal
☐ Filtration Plant	☐ Stabilized Roads	☐ Chemical Treatment
☐ New Pumps	☐ Widening Narrow Bridges	☐ Sand Filter
☐ Cleaning Water Mains	☐ Constructing Curbs	☐ Refuse Incineration
☐ Swimming Pools	☐ Constructing Sidewalks	☐ Storm Water Drainage

Name ..... **Project is for** Town / Village / County / City } **of**.....

Title or Position..... **State** .....

Address ..... **Approximate Cost $**.....

Reconstruction of an Uneven Wood Block Pavement

By THOMAS F. ROBINSON
City Engineer, Chicopee, Massachusetts.

THE surface of one of Chicopee's most travelled business streets was paved with a wood block pavement laid partly in a sand cushion on a cement concrete base; and at a later date, a portion of this street was paved with wood block in a hot asphalt cushion or mat upon the above mentioned concrete base. The length was 2100 feet and the width from 24 to 40 feet. This pavement was laid on the sand cushion about 1914 and on the asphalt mat about 1922, when a street railway track through the center of the street was removed.

Thomas F. Robinson

The surface of this wood block pavement was very uneven and was the source of many complaints to the city government during the last few years. However, the problem of replacing it or applying a reformed surface was more pronounced because of the business depression and the limited amount of city money with which to work.

Confidence in the concrete base was justified after observing its condition where previous utility trenches had been excavated through it, and the search narrowed down to what type of top or wearing surface could be recommended to replace the wood blocks.

Reference to a recent cross section showed that we had a certain definite established curb line and surface grade which had to be adhered to; the alternative if the curb grades were lowered was the disruption of business and store thresholds on the street line, together with the scrapping of all existing sidewalks. On the other hand, if these were to be maintained, the face or curb reveal, after placing an assumed depth of say 2 inches of sheet asphalt, would be as much as 10 to 11 inches the entire length, which would be prohibitive.

After some research work and due consideration of city equipment, a decision was reached to replace the blocks with one-course asphalt macadam (penetration method), plus a seal coat of asphalt and stone chips, averaging about 4 inches depth over the present concrete base. This construction leaves a curb reveal of about 8 inches and is planned so that an additional surface of bituminous concrete or sheet asphalt can be applied at a later date when wear necessitates such a surface.

Work on construction of such a surface was started in midsummer of 1937 as a WPA project. The first operation was to dispose of the wood blocks, which was done at no cost to the city by permitting the welfare workers to take them for fire wood.

The concrete base was then thoroughly cleaned with street brooms and washed with the fire hose. With the concrete base thus laid bare, the first real opportunity for inspection was at hand. This inspection revealed that this concrete base was in excellent condition, except for a few scaly spots and for sewer and water connection trenches. These scaly spots were removed, and the trenches patched with new concrete; the manholes and catch basins were reset to the new surface grade and the curbs realigned where needed.

In order to determine the new surface grade, cross sections were taken on the concrete base and on all street intersections to discover the critical points and maintain a minimum depth of not under 2½ inches of broken stone. Now being ready for the stone base, a tack coat of RC-3 asphalt emulsion was applied to the thoroughly dry concrete base, at the rate of one gallon to 15 square yards of surface. Next, 1¼ to 2 in. trap rock was applied to the required depth in one layer over half the road width and rolled. (The road was kept open to traffic and business during the entire period of construction.) Here, experiment proved it could be rolled too much, which caused waves and crushed the stone, and a good deal of patience was required by the roller operator to get the proper compactness using the 12-ton roller.

This base was then penetrated with asphalt from a pressure distributor at the rate of 1¾ gallons per square yard, coated with stone chips and rolled lightly.

The specifications call for a seal coat of asphalt at the rate of ⅜ gallon per square yard of surface, but this has not been applied owing to the winter setting in before it could be done. This will be done this spring. Consequently, the road without a seal coat has been subjected to a very extreme winter condition when temperatures changed from 20° below to 50° above zero. It was open to business and industrial traffic during the entire winter.

The surface is at present in a very satisfactory condition and shows no signs of ravelling or loosening from the base.

Resurfacing old wood block pavement on Exchange St., Chicopee.

How a Flat City Cleans Sewers

By JOSEPH H. LeCHARD
Engineer, Atlantic City Sewerage Company

ATLANTIC CITY, N. J., is located on Absecon Island, a strip of land nine miles long by approximately one mile wide, about five miles from the main shore line. The permanent population is 70,000 but it entertains about 15 million visitors annually in hotels and cottages. This variation in population presents some difficult problems for the city operating departments and public utilities.

The first sanitary sewers were laid in 1884, when the island was little more than an excursion village, and the system has grown until today there is 84 miles of vitrified clay, cast iron and reinforced concrete pipe of sizes from 6″ circular to 6.5 x 5 ft. rectangular, with 1,650 concrete and brick manholes. To it are connected 14,200 house sewers, 5,220 of which have a concrete box constructed around double handhole traps located just inside the curb line. Six miles of cast iron b & s pipe from 10″ to 36″ diameter is used as a pressure main. The system is owned and operated by a private company.

The general design of the collecting system is unique in that the sewers are for the most part cross-connected. In case of a complete stoppage or sewer failure, the flow may be re-directed over a circuitous course to the sump well, until the repair can be completed. This is possible because the sewers in each drainage district are confined to a close range of levels, making it easy to extend the upper end of a sewer into the manhole at the street intersection above.

The surface elevations on this island vary from 4 to 12 ft. above mean sea level, so that the sewer grades are necessarily too flat to provide good self-cleansing velocities, and keeping the system in satisfactory operation requires continuous cleaning. This is effected by two organizations, each with its particular duties and special equipment. Each group has a carefully planned schedule which keeps it busy throughout the entire year. One keeps the street sewers clear, the other the house connections.

The unit that cleans the street sewers is provided with a tool and equipment house mounted on wheels which accompanies them on the work. The bulk of the cleaning is done with two O. K. Champion power cleaners which are trailed back of a truck, operated by a crew of three men, one to operate each of the machines and the third to dump the bucket into large airtight can containers. A machine is placed over each of two manholes, the manhole lids removed, and a light cotton cord (such as is used for giving grade in sewer construction) is floated through the sewer, from the upper manhole to the lower, by a float attached to its end. This is used to draw through the sewer a 3/16 inch cable attached to a small hand-operated drum which is mounted on the cleaning machine. When this reaches the lower manhole, a half-inch cable is attached to it and is drawn back to the upper manhole and attached to the power-driven drum. Just a few minutes are necessary to connect the sewer bucket, the size of which is determined by the size of the sewer to be cleaned, to two cables, one attached to each machine. Meantime the third man has clamped in position at the bottoms of the manholes the guide sheaves through which the cables run.

The bucket is then drawn through the sewer against the flow until it has a full load, is returned to the lower manhole and emptied; and this procedure is repeated until the full length between manholes has been cleaned. The bucket then is removed and replaced with a wire brush which fits the sewer snugly and is pulled through it by the power drums. This brush removes grease attached to the sewer which had not been reached by the bucket. The machines are then disconnected and that at the upper manhole is moved to the manhole below the other and the stretch of sewer immediately down stream is cleaned.

When conditions are such that the float can not be used to carry the cable through the sewer, this is accomplished by the use of interlocking sewer rods 3½ feet long. Once these have been placed in the sewer they may be pushed from manhole to manhole without being disconnected, until the end of the sewer or an angle point is reached. If necessary, the string of rods is anchored in the sewer over night to be ready for use the following day. Our vernacular term applied to this operation is "walking the rods," and it is a time saver where long mains that are flowing full have to be cleaned.

The bucket used for cleaning is that known as the Kuhlman expansion bucket. When drawn forward it bites into the blockade, fills itself, and when drawn back its jaws snap shut, securely holding the load. The

Atlantic City's sewer cleaning machine.

filled bucket is raised to street level and up to the boom hook, when its jaws open automatically and the bucket simultaneously expands to 110% of its normal size, thus releasing the load, which falls to the street. The bucket contains an automatic safety clutch linking the knee-action wheels with the clutch lever, which operates instantly when any predetermined tension is exceeded, as by the bucket striking an immovable object in the sewer; the cable then compressing the springs, which in turn trip the clutch, thus relieving the cable pull. This saves cost of cable replacement due to broken strands, and elimination of strains in the entire equipment. Also it saves the sewer from damage should the bucket strike an uneven joint. The machine is equipped with hand crank handles which can be used to free a bucket, should it be necessary to do so, by working it back and forth by man power.

A level wind attachment on the cable drum causes the cable to be reeled and unreeled with utmost precision in perfectly parallel, closely laid coils, with no chafing or jamming due to one coil being wound on another, materially lengthening the life of the cable. There is a secondary "free wheeling" clutch on the cable drums which comes into play when unreeling the cable into the sewer while the other machine is pulling the bucket toward it. This entirely disconnects the 20 to 1 reduction gear train that connects the cable drum to the motor, the 8″ drum (which has a capacity of 750 ft. of cable) then revolving freely on its axle, thus conserving power and eliminating wear and tear incident to running high reduction gears in reverse. This clutch is put into engagement with a flip of the hand and released with a slight wrist movement that locks it in the open free-wheeling position. The power unit used on these machines is a 5 to 7 hp Le Roi enclosed gasoline engine.

The cleaning of house sewers is performed by an organization which is on duty 24 hours every day of the year, the men remaining on call to reach any section of the city within 30 minutes from the time of notification of stoppage. The reason for this is that the sewer company is responsible for maintenance of service in the house sewer from the main to the double handhole trap located just inside the curb line, the owner being responsible for that from there to the house. We have a working agreement with the Masters Plumbers Association of our city whereby we will not encroach on their territory as representatives of the property owner, and they in turn will not concern themselves with our part of the house connection. The responsibility in each particular case is easily determined by lifting the removable lids from the trap located at the curb. If inspection reveals that the sewage does not drain properly at this point the task of making a remedy for the condition is ours. On the other hand, should the drainage be proper, the plumber looks for the trouble in fixtures, waste lines or his part of the house sewer. We have found that the most useful piece of equipment to remove the ordinary stoppage in a house connection is a fifty foot length of quarter inch diameter steel wire. The end which is placed in the sewer is bent for a distance of six inches and as it is directed into the stoppage a spiral motion is produced by cranking the other end of the wire.

Grease from kitchen wastes and sand from bathing suits are our two worst enemies insofar as collecting system operation is concerned. Grease is the more troublesome of the two because it can reduce the area of a sewer in such a short period of time, thereby curtailing the capacity resulting in a stoppage. The effect of grease upon the collecting system is, while annoying, most interesting. At the time of its disposal at the kitchen sink, the grease is hot and rising to the surface of the flow as it does, it is swept against the sides and top of the sewer pipe. Cooling as it flows, it sticks or freezes to whatever it comes in contact with, and in a short time becomes very hard and extremely difficult to remove from its peculiar position on the tops and high sides of the sewer. All of the grease does not adhere to the pipe; quantities of it pass through the collecting system in the form of balls and hang on the 1½ inch bar screens which protect the pumps. Burnt matches are thrown into toilets, urinals, floor drains, etc., in large quantities daily, and float in the sewage, and as the hot grease from the kitchen sink comes along, cooling en route, the match in the swirl of the flow takes on a beautiful coat, then adds an overcoat, repeating continually until it becomes the center of a grease ball. Where sewers are flowing full, or nearly full, these floating grease balls frequently congregate in manholes until there are so many they have to be removed or they would eventually cause a stoppage.

Factors That Reduce Theoretical Traffic Volume

The Bureau of Traffic Planning of the City of Pittsburgh, Pennsylvania, has conducted observations of downtown traffic conditions to show how various factors reduce theoretical maximum traffic flow to the much lower values that occur in actual practice. This was reported by L. W. McIntyre in a paper before the ASCE. The following summary was issued by the Highway Research Board.

Although maximum capacity for a single lane, with interferences eliminated, was computed to be from 2,000 to 2,500 passenger automobiles per hour, counts of actual traffic volumes per lane for several typical congested Pittsburgh streets showed a range of from only 132 cars per hour to a maximum of 754 per hour. The reasons for most of this startling difference between capacities and actual flow are explained in the following enumeration of interferences:

1. Interference by cross-traffic reduced street capacity 50 per cent.
2. Stopping a lane of traffic reduced its capacity 35 to 50 per cent when the stops occurred close together.
3. In the absence of pedestrian control, as much as 23 per cent of pedestrian traffic crossing the street interfered with vehicles, with as many as 56 per cent of pedestrians crossing against traffic.
4. On the average, a passenger car turning left delayed following traffic a length of time equal to that required for four vehicles to go straight through.
5. A large parking lot or garage with entrance on a main thoroughfare may effect a reduction in street capacity to from 20 to 40 per cent of the traffic which would otherwise use it, depending on the number of lanes of moving traffic.
6. Curb parking reduced traffic capacity to 50 per cent of the volume that could otherwise be accommodated.
7. One automobile weaving from one lane to another may cause change in effective headway equivalent to six vehicles moving straight ahead.
8. Trucks reduced street capacity 25 to 40 per cent as compared to passenger cars.
9. As much as 50 per cent of the traffic was non-business-producing through traffic.

It is pointed out that the traffic flow of city streets is not proportional to the number of lanes; that streets in congested districts do not follow the same laws in this regard as rural highways because of considerable variation in interference factors from street to street.

Street Maintenance Methods by Pavement Types*

By H. W. KUEFFNER
Director of Public Works of Durham, N. C.

PAVING maintenance should be thought of as stage construction or progressive steps toward making a better and better pavement. It should not be done in a temporary manner if it can possibly be done with a thought to the future of the pavement.

Maintenance is necessary to care for wear, deterioration, damage by cuts and damage by carelessness Prompt attention to it is economy and is appreciated by the public.

Water-Bound Macadam—To adapt to modern traffic, level off high spots, fill depressions with crushed stone and cover with bituminous mat of penetration type, hot or cold, preferably hot; mat thickness 1″ to 2½″, depending on traffic and funds available. If funds for a bituminous mat are not available, a temporary expedient is to scarify and add enough gritty clay to bind, and about 1½ lbs. of calcium chloride per square yard, mix thoroughly by blading back and forth, and roll to a smooth, tight surface. This will last for approximately a year.

Bituminous Macadam, Asphaltic Concrete and Sheet Asphalt—The most common maintenance items are patching and crack filling.

Before patching, correct the cause (faulty base, poor drainage, etc.) if possible. Make patch of same material as surrounding pavement, and watertight. Cut out spot to be repaired with vertical edges for at least part of the depth, paint or spray with liquid bitumen of a consistency to spread in a thin coat, place the bituminous mixture and compact thoroughly by tamping or rolling; placing and compacting in two or more layers if more than 2½ in. deep. The mixture can be made by penetration, but premixing is better. When coarse aggregate mixes are used broken stone is preferable to gravel, and the surface should be sealed with a fine mix.

Ruts and waved areas cannot be satisfactorily repaired by cutting off ridges and filling depressions, but uneven surface must be removed and replaced with the correct paving mixture—if sheet asphalt, with what is known as a tough mix made by slightly increasing the amount of asphalt and filler.

Most cracks are either contraction cracks, usually transmitted from base or subgrade, or check cracks, usually due to drying out of the surface. They should be repaired in fall or early spring, or both, when the cracks are wide open. Thoroughly clean cracks by compressed air, using hose and tapered nozzle, and while dry fill with soft bitumen (60 to 70 penetration) that will readily flow to the bottom of the crack and dust with rock dust or dry sand. Pots are on the market with a spring valve at the lower end and a small opening for filling the cracks without wasting the crack filler. Wide cracks can be filled with coarse sand followed by crack filler, or with a mastic of fine aggregate and soft bituminous material.

Junction of U. S. 70, U. S. 501 and U. S. 15. Paved in 1920, sheet asphalt with 4-track street railway paved with vitrified blocks. Entire street resurfaced with 2″ sheet asphalt in 1937

U. S. 501 and 15. Paved in 1922, sheet asphalt with durax car track paving. Entire street resurfaced with 1½″ sheet asphalt in 1938

Resurfacing is more economical than patching when the pavements are worn or contain numerous cracks. Conditions should determine the type of resurfacing selected. Some question the value of a seal coat, but I consider it worth many times its cost in some cases. When there are many cracks, moisture may get into the pavement and destroy it, and a thin coat is better than trying to seal each crack separately; but first large cracks should be filled and all patching done. A seal coat improves the appearance of a patched street. Apply a thin coat of low-viscosity bitumen to a clean, dry surface by means of a pressure distributor, 0.2 to 0.4 gal. per sq. yd. Cover immediately with 15 to 25 lbs. of stone chips or coarse sand, preferably using spreader gates on dump trucks (to save time and money and get a more uniform spread than is possible by hand) followed with a broom drag with spring steel brooms, which levels the surface. We also use a 10 ft. section of 6 ft. wide chain link fence as a drag, which turns the chips over and coats them with bitumen. Then roll completely. Our costs on this class of work vary from 7 to 10 cts. per sq. yd.

Various types and thicknesses of resurfacing materials are used. Some cities soften the old sheet asphalt with a surface heater, remove as much as necessary by rakes and replace with new material. In resurfacing a Durham street having a double-track railway paved with vitrified block in the center we laid 1½″ of sheet asphalt feather-edged against the brick gutters. The pavement was thoroughly cleaned, uniformly coated with 0.1 gal. of cut-back asphalt one day before laying the sheet asphalt, which was laid exactly like a new pavement. We found that it was not necessary to cut out a heel at the edge of the brick gutter. Manhole heads were cut out of the pavement with pavement breakers and reset to the new grade immediately before laying the new surface, replacing the old concrete base with asphalt binder course tamped in layers around the casting.

*Abstract of a paper before the Street Superintendent School at North Carolina State College.

Concrete cracks should be filled in the fall and early spring, using asphalt or tar soft enough to penetrate to the bottom of the crack. For wide cracks, use mastic tamped in place or coarse sand followed by crack filler. Holes and depressions should have edges shaped and made vertical, cleaned and painted or sprayed with an even coat of light bitumen. Hot or cold mix is then placed, in more than one layer if depression is deep. Settled sections can be raised to grade by mud-jacking. A bituminous wearing course over a worn pavement waterproofs it and provides a cushion against impact, prolonging its life. Repair holes, fill cracks, clean thoroughly and tack coat with 0.1 gal. The surface can vary from ¼" of sand on a bituminous coat, to 3" of sheet asphalt with binder course; preferably a multiple-course surface with 2" total minimum thickness to last for several years.

Cobblestone and Granite Block—Maintenance of the former is not recommended, but such surfaces can be leveled off with a bituminous mixture and covered with a mat not less than 2" thick at any point—uniform thickness is desirable. Granite blocks can be given similar treatment with better results. In some cases an irregular surface can be improved by relaying the old blocks.

Brick Pavements—Joints should be kept filled to prevent cobbling. Worn brick can often be removed, turned and replaced. If badly worn it can be resurfaced by filling depressions and replacing shattered areas with a bituminous mixture rolled or tamped to a proper grade and crown, tack coated, followed by a bituminous mat not less than 1½" thick (a thinner one tends to separate from the brick).

Wood Block—To prevent moisture absorption, apply a seal coat of asphalt or tar. For bleeding, apply sand and remove it when saturated with oil, applying more if necessary.

Service Cuts—Permits for these should be required, with fees sufficient to take care of all expenses of the city caused by the cuts. Cutting and backfilling should be inspected by a city representative and pavement replaced by city forces or under their direction. A temporary surface may be desirable, and can be kept up to grade, as backfilling settles, with a cold bituminous mix. For the final resurfacing, trim pavement back from cut about 6" on all sides to give support on undisturbed subgrade. For concrete base or surface, it is expedient to use high early strength cement, or a 1-2-3 concrete mixed 5 minutes with a minimum of water. Have a wearing surface extend about 6" beyond base patch. In patching block pavements, remove cut or broken blocks and key new ones into the openings. By using an iron plate laid on a sand cushion extending slightly beyond the patch, traffic can be allowed on it very soon.

Repairing a Sewer Cave-in In Quicksand

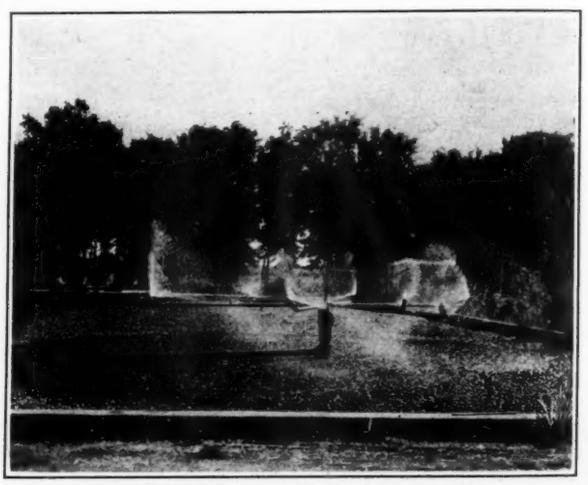
By John Buehler, City Engineer

In the summer of 1937 a serious cave-in occurred of a 15-inch vitrified clay sewer which carried the sanitary sewage of two-thirds of Nekoosa, Wis., including the business section. The sewer was completely blocked and the sewage backed up into many residences. A storm sewer crossed this sewer near the break, and this also caved in. The break was about 10 ft. from a railroad line, but as this was a loop and not a main line, trains were not run past the break during repairs but were shuttled in.

This sewer had been laid in 1927, and at this point was 14 ft. deep, 7 ft. being quicksand. The break was about midway between two manholes 450 ft. apart, and it was decided to put in another manhole at this point.

The first thing done was to pump out the sewage and ground water, using a 600 gpm Seagrave fire pump, after which a gasoline-powered trench pump was kept in operation until the sewer was opened up. Digging down to the sewer, it was found that the break apparently had been caused when the sewer was built by the falling on it of a trench brace which was found in the break. When enough of the dirt had been removed from the sewer to permit the sewage to flow through it, permanent repairs were begun.

From a junk yard we got a piece of old boiler 4 ft. diameter and 5 ft. long. This was sunk down to the sewer, and the space between it and sheathing was filled with concrete; several 2" pipe being driven into the ground at the bottom of the manhole to drain the ground until the cement got hard, after which caps were screwed onto the tops. A manhole was then built inside the boiler, of the usual brick construction. After this the remaining sand in the sewer was removed by use of the regular sewer rods and scoops.



Page experimental distributor at Marshfield, Wis.

Glazed Pottery Filter Nozzles

Rotary distributors for sprinkling filters are in service at Marshfield, Wis., and two at Baltimore which use a new type of nozzle, which was developed to meet the need for a more uniform, rain-like distribution of sewage in connection with high-rate filtration—15 million gallons per acre per day and upwards.

The nozzles are of the centrifugal type, made of hard burned pottery highly glazed, with orifices ranging from ⅞" to 1¼" diameter, with no spindles, cones or splash plates. According to A. A. Page, the inventor, the centrifugal action of the sewage in passing through the nozzle produces a rain-like spray and, combined with the large orifice, prevents clogging. The nozzles are set at an angle with the vertical which produces revolution of the arms and is adjustable to produce the optimum distribution with any given head and distribution rate. In the Marshfield distributor there are six arms, all of different lengths, with a nozzle on the end of each.

A head of about 5 ft. is required, compared with about 2 ft. for other rotary distributors and 6 or 8 ft. for fixed nozzles. But the uniform distribution or rain-like spray is considered to be well worth the additional head.

Filtration vs. Softening at North Chicago

By L. WAYNE FENNELL
City Engineer, North Chicago, Ill.

NORTH Chicago, Illinois, a city of 10,000 inhabitants located on the west shore of Lake Michigan 35 miles north of Chicago, is primarily an industrial city. Some of its main industries are the U. S. Steel Corp., Cyclone Fence Co., American Can Co., Abbott Laboratories, Fansteel Metallurgical Laboratories and many others. These industries have promoted a growth which the water supply has found it difficult to keep up with. Back in 1900, when it was a village of 250 voters, the first water works were built on a tract of land 250 by 150 ft. donated to the village by the owners of the Bord du Lac Subdivision. With W. B. Ewing as engineer, a contract was awarded to Allen & Wright and J. E. Hale and the plant was completed in 1901 at a cost of $20,095.50.

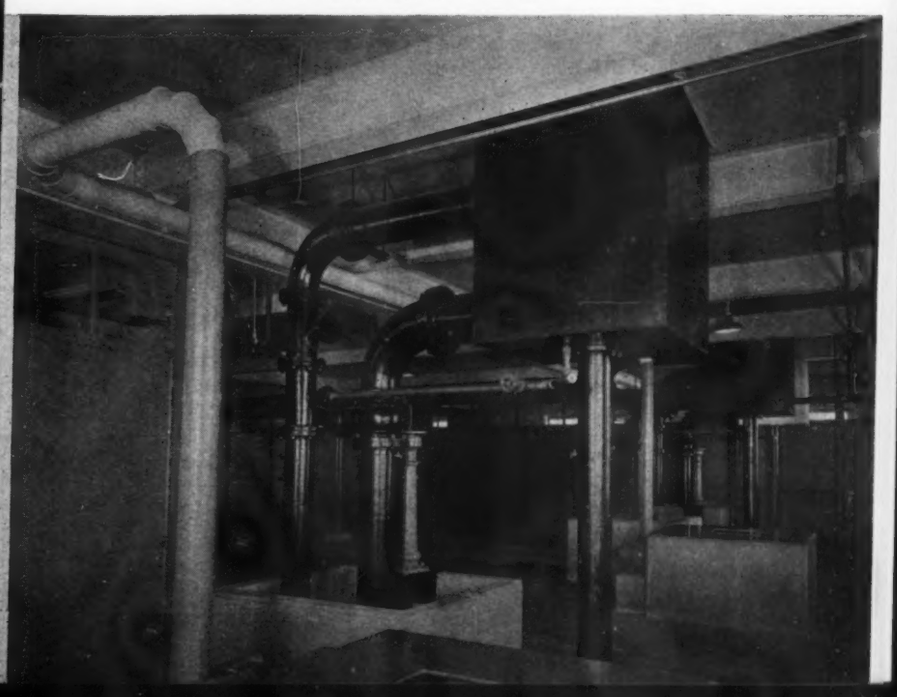
This original plant consisted of a reservoir well 25 ft. diameter by 15 ft. deep, a 100,000 gal. elevated storage tank (still in service), steam boiler, feed-water heater, and one low-lift and one high-lift steam pump. Its capacity was 1 mgd. Water was pumped direct from Lake Michigan to the reservoir well and from this to the storage tank, with no treatment. A serious epidemic of typhoid fever resulted from the use of this untreated water in 1921 and the City Council decided an improvement in the supply was necessary, and in November 1921 two wells were sunk by William Cater, a private contractor, and the water from them was purchased from him until 1923, when the city purchased the wells and equipment for $150,000.

The Cater plant so purchased comprised a 1700 ft. and a 2100 ft. well; two deep well pumps, one 1,000 gpm and one 1200 gpm (discharging into the old reservoir well) and two high-lift pumps, one 700 and one 900 gpm rated capacity, all electrically driven. Water from these wells was fairly safe but very hard, that from the deeper well 425 ppm and from the other 385 ppm.

By 1934 the council decided to look into the matter of water softening but found the cost so high that filtration of lake water was considered. Allen & Vogtborg, Inc., were employed as consulting engineers and reported the filtration plan as possible and very practicable and a PWA grant for constructing such a plant was obtained, plans completed by the engineers, and a contract for same awarded on Dec. 28, 1934 to the Peter N. Kruse Co. of Chicago. Ground was broken March 20, 1935, and on May 25, 1937 the new plant was put in operation.

The filtration plant, which has a rated capacity of 2.5 mgd, is enclosed by a building 160 ft. long (including underground reservoirs) by 65 ft. wide, of reinforced concrete and brick with glazed tile interior. Besides the filtration plant proper, this building contains a laboratory, office, store rooms and toilet.

A 16″ raw water intake pipe extending 2200 ft. into the lake brings the water by gravity to two pump pits each 5′ 6″ by 14′ deep, from which it is pumped to three aeromix basins by four 725 gpm Allis-Chalmers pumps, from which point it flows by gravity through the rest of the plant. Before it enters the aeromix basin the water



Left—Filter pipe gallery showing piping from No. 1 filter. Large pipe at top is waste water header. Next below is wash water drain. Below this, elbows connecting collector tubes to effluent header. Below—main floor; black square tanks contain primary aerators, with raw water main and overflow at left; from bottom is pipe carrying water to umbrella head enclosed in the raised square manholes. White pipe at left removes gases from manhole

is dosed with activated carbon and alum (about 12 ppm) is applied in the aeromix basin by solution feed. Gases and air released by the aeromix are withdrawn by a blower and duct system and discharged to the atmosphere; while the water, discharged over an umbrella head, enters one or more of three sedimentation basins, each of which is 65′ x 18′ with normally 12′ depth of water, giving a detention period of 3½ to 4 hours.

The sedimentation basins are separated from the filters by a wall, the top of which serves as a submerged weir over which the water passes from one to the other, thus eliminating an influent valve to the filters; the water standing at the same level in both basin and filter. When washing a filter, the raw water is shut off from its sedimentation basin and the water on the filter is lowered below the weir sufficiently to permit washing. The three filters are rapid sand type, with 30″ of sized silica sand on 20″ of graded gravel, each 18′ x 16′ with a capacity of 800,000 gpd. Each has four waste water troughs, oval shaped 1′ wide and 1′ 5¼″ deep, each connected to a waste water header extending through the filter wall, which in turn is connected to a sewer outside the building. Each filter has nine collector tubes 4¼″ inside diameter, running the full length of the filter and extending through a flanged fitting with 7″ diameter bore set in the end wall, the tube being screwed into a flange on the outside of the wall, to which flange is also screwed a 4¼″ nipple, which nipple is flange-connected to an elbow, and this in turn to the collection header. The collector tubes are laid in semicircular depressions in the filter floor and diffuser plates over them support the gravel. With this construction it is very easy to remove a filter tube by simply removing the flanged nipple and elbow and pulling the tube out of the filter bottom.

The filtered water passes through the effluent piping in the filter gallery into the clear wells. Chlorine is applied to the water as it enters the well, using two Pardee chlorinators, each with a capacity of 8 lb. per million gallons.

From the clear wells the water passes into the final aeromix basins and from these into two storage reservoirs, each having a capacity of 130,000 gallons. From the reservoirs the water passes back to the two pump suction pits which are located under the filter pipe gallery. From these it is pumped to the city by four Allis-Chalmers high-lift pumps, one of 325 gpm, two of 650 gpm and one of 1,300 gpm.

This plant was consctructed at a cost of $250,000. It is operated by a personnel of four operators, a superintendent and a chemist. It has many novel features, better explained on the spot. Every one is cordially invited to inspect it at any time. John P. Dromey is mayor; the members of the water board are Arthur Nelson, Joseph Zorc, Henry Wasniewski, L. J. Bartlett and John Milroy. The writer is superintendent of the plant.

To Readers of the Manual of Water Works Equipment and Materials

In the advertisement of the Simplex Valve and Meter Co. which appears on page 75 of the 1938 edition of the Manual of Water Works Equipment and Materials, a mistake was made in the caption of photograph shown. This shows the foyer of the new filtration plant at Covington, Ky., not Lexington; and J. S. Watkins was the consulting engineer, not the construction engineer. We hope that this correction, which is made at the request of the Simplex Valve and Meter Co., will come to the notice of all who received copies of the Manual.

Automatic Pump Control at Caledonia

BY ABNER HOUGE

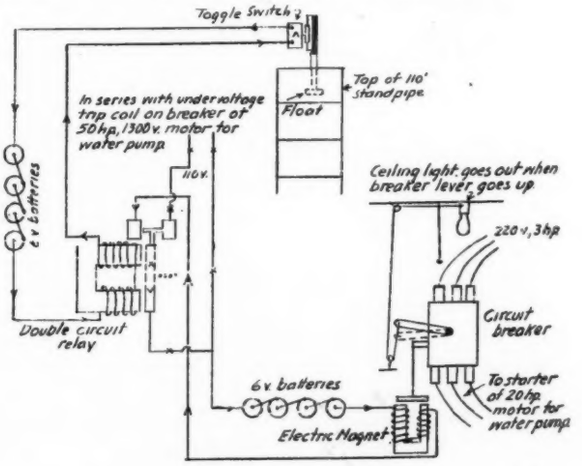
Superintendent, Municipal Light and Water Dept.

CALEDONIA, Minn., obtains its water supply from two wells, each 400 ft. deep with the ground-water level about 270 ft. below the surface. These are provided with deep-well, double-acting plunger pumps; a Downie 120 gpm driven by a 20 hp., 220-volt motor, and a Pomona 300 gpm driven by a 50 hp., 2300-volt motor. These discharge into the distribution system, to which is connected a standpipe 10x110 ft., which was built in 1894. Its capacity, 65,000 gal., is less than double one day's consumption, and its diameter is so small that the pumps (whose combined capacity is about three times the ordinary maximum rate of consumption) have to be stopped and started at comparatively short intervals.

Formerly the pumps were stopped and started by hand and it was necessary to watch the pressure gauge to prevent the standpipe overflowing — which wasted time if we did and wasted water if we did not. Overflowing in the winter caused ice to form on trees, bushes and the waterworks building. The remedy was some contrivance for starting and stopping the pump automatically, and the writer devised the arrangement shown in the accompanying sketch. This has been operating as intended for two years without once failing.

Our ten blocks of concrete pavement are flushed twice a month during the summer months. For this we use an old-time 500 gal. sprinkling wagon, to which we attached an old car motor which drives a rotary pump which gives pressure to the spray nozzles, which wash the dirt to the gutters, whence it is hand-swept to catchbasins.

We are 100% metered, the meters (Tridents) being sold to the consumers for $12.50 cash, or $14 if paid in instalments of 25 cts. a month. These are serviced for 10 yrs. free of charge unless damaged by freezing or otherwise. Old meters, owned when the water department took over this service in 1930, are serviced at a cost of $1.50 plus cost of repairs if needed.


Toggle Switch
Top of 110' standpipe
Float
In series with undervoltage trip coil on breaker of 50 hp, 1300 v. motor for water pump
110 v.
6 v batteries
Ceiling light goes out when breaker lever goes up
220 v, 3 hp
Circuit breaker
Double circuit relay
6 v batteries
To starter of 20 hp motor for water pump
Electric Magnet

The Editor's Page

The PWA and the WPA

For engineers and for the construction industry quite the most important recent news is that of the huge sums that are to be spent on public works construction. With local contributions included, this will total in the neighborhood of four billion dollars. Wisely expended, this money will purchase a great deal of better living in the form of modern sewage treatment plants, improved highways, water systems, and similar construction.

In this issue we have outlined briefly some of the factors governing the approval of PWA and WPA projects, have provided a check list of desirable improvements, and offered our help to communities that feel they need it. We are intensely interested in having this money expended in projects that will yield dividends in better living, health, convenience and comfort. There is also another factor: The most desirable projects are those that, after construction, will require the least possible maintenance and will return the greatest possible dividends. And in the attaining of these ends, good construction is an important factor. Using cheap materials or cheap methods, or building into the structures anything but the best equipment available is a most short-sighted policy.

Equipment and Materials in Federal Aid Work

We believe that the idea, advocated when federal relief was first started, that all the funds possible should be given to direct labor and a minimum for equipment or materials, no longer prevails. From a broad point of view, money spent for the latter purpose also goes to labor, and such spending is equally justifiable. That this labor is not local is not a valid argument against such spending, even from a purely selfish point of view. For there is no question that, for a dollar spent on almost any kind of public work, better value to the community can be obtained by using modern methods than by relying on human muscle entirely, or by using only locally available materials. A mile of water-bound macadam road built with hand-broken stone costs as much as a mile of good asphalt using crusher-broken stone, but is of infinitely less value to the community which pays for it. A swimming pool can be built with walls of stone laid by hand and plastered; but it would not be as serviceable, durable or creditable to the community as one made with concrete. Moreover, the equipment remains as a continuing asset to the community.

To the fear some may have that, if any money is spent for equipment and material, not enough will remain to furnish work for all who are on relief, it can be said that there seems little doubt that enough federal funds can be had for both purposes. In fact, news reaches us of many communities urged to accept more funds than they have asked for.

As we go to press we learn from Administrator Ickes that he estimates that more than a billion dollars will be spent for materials on PWA works alone.

Practical Application of Research Results

A valuable address, and one which should stimulate changes in practice which would benefit all engineers, was one delivered by Frank T. Sheets, president of the Portland Cement Association, before the American Concrete Institute. Taking as his theme: "Shorten the Lag Between Research and Practice," he said that "One of the greatest ills of the engineering profession is the . . . time elapsing between the discoveries and findings of research and their general acceptance and application by engineering practitioners."

Research he defines as "the honest, intelligent, painstaking search for useful truth." If it is not useful, it is not research; and if its results are not used it fails of its fundamental purpose. Why they so often are not used is the question he considers, and finds it too often due to the way in which they are made public. Researchers he classifies under eight heads, from inhabitants of the technical stratosphere to "the rare species who simultaneously contribute unselfishly, think deeply, conclude soundly, talk simply." Many combine the first two but fall down badly in the effort (if indeed they make it) to make the practical conclusions understandable to those who could use them in practice.

Illustrations of this are found in abundance in papers published in the proceedings not only of technical societies but also of those composed largely of engineers and others who are engaged in practical application of technical knowledge. The latter class, when they see a paper consisting largely of complicated mathematical or chemical formulas or tabulated results of numerous experiments, have not the time, if they have the ability, to study them carefully and draw reliable conclusions therefrom which can be applied in their daily practice.

Exceptions can fortunately be found in the reports of a number of our college experiment stations and of some of the societies, which "incorporate in the body of the report a statement of the problem, the essential findings of fact, and conclusions for embodiment in practice—putting in an appendix or supplement the other information which fellow researchers would find interesting and helpful in analyzing the researcher's report." Illustrations of such reports are found in the Proceedings of the American Society of Civil Engineers and in the Sewage Works Journal.

In many cases, however, there is needed what Mr. Sheets calls an "interpreter"; some one who can "analyze and assimilate the researcher's findings and state them in language which the average practitioner can comprehend. An alternative would be a joint committee of researchers and practitioners who will review a research report before its release, to insure that the statements are not only sound from the research point of view but understandable and in form for application by the practitioner."

We hope that these ideas of Mr. Sheets will receive the consideration of secretaries, committee chairmen and other officials of technical and engineering societies, and of researchers in college and other research laboratories.

A New Solution to the Parking Problem

By ALLAN H. ROGERS

Supt. of Public Works, Garden City, N. Y.

GARDEN CITY is a suburban residential community with a population slightly over 10,000, located in the approximate center of Nassau County, Long Island, some twenty-odd miles from New York City. Originally founded in 1869 by A. T. Stewart, the ideals of the founder for "a garden city" were carried on, first by deed restrictions, and, after incorporation as a village in 1919, by a comprehensive zoning ordinance; and always with careful planning, to the end that the village has retained an unusual amount of charm and atmosphere. Until recent years, the business development was quite small, confined principally to essential shops, and residents patronized either New York City stores or the larger business sections of adjacent villages. Garden City's tradition, its geographical location, its undeveloped but still centrally located business section, and other factors all naturally contributed to an expansion of the business area, which, heightened by the establishment of suburban branches of several New York City stores, brought motor vehicles from a large trade territory to add to the local traffic.

Several years ago, village authorities recognized the need of providing for the establishment of municipal parking areas in the vicinity of business and adjacent apartment house properties, and devoted a considerable amount of time to a study of this problem for the purpose of devising a plan which would encourage the proper development of these districts and serve the best interests of the village. Several tentative plans were prepared, all somewhat similar in the rejection of the common parking lot serving a considerable area, the principal thought being to locate the parking facilities in the rear of the properties they were to serve, or at least as close thereto as was reasonably proper. This method accomplished several objectives, namely, utmost convenience, minimum property depreciation, and minimum cost because of acquisition of rearage instead of valuable frontage.

Due to the depression, action on the matter was temporarily held in abeyance. It soon became apparent, however, that the congestion of traffic due to the parking of motor vehicles on streets and private property in the business areas and in the residential areas immediately adjacent thereto, was increasing so rapidly that further delay in the matter would be inadvisable.

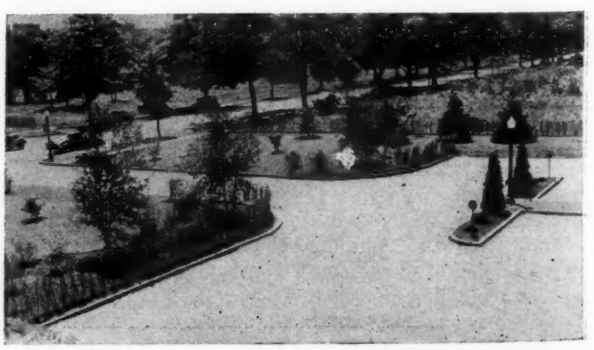
In 1936, a definite parking plan to serve the established business and apartment house section was drawn up. This plan was designated as "Section No. 1," being part of a long-range plan to make similar provision for all business property as required, and had the consideration and approval of the several property owners' associations and the Chamber of Commerce. During the early part of 1937, the Board of Trustees adopted the necessary resolutions directing the acquisition of the property. On November 26, 1937, following the institution of condemnation proceedings pursuant to Article XIV of the Village Law of the State of New York, the Village vested title in the several parcels of land to be acquired. Many novel questions have arisen under this new statute, which was enacted in 1934, and the opinions of the Court are the first judicial interpretations of certain of its provisions.

The total cost of acquisition, amounting to $143,165.58, was assessed against the adjacent business and apartment properties benefited, the owner having the privilege of electing to pay his net assessment in ten annual installments. The net assessments, after setting off in certain instances the awards, totalled $89,722.26, against which the village issued $77,000 of bond anticipation notes for the purpose of temporarily financing a portion of the cost of acquiring such properties, it being anticipated that some owners would elect to pay their assessments in full in lieu of on an installment basis with interest.

The improvement of these parking areas, at an estimated cost of $40,000, is being done at general village expense. $2,000, or five per cent of the total, was appropriated in the 1937-38 budget and the balance of $38,000 is to be financed by bonds maturing in annual installments over a period of five years, bond anticipation notes having been issued for temporary financing.

As soon as title was vested, construction work was rushed on three of the parking fields to make them at least partially available for the Christmas season. Work has been continued during the winter and spring months, with additional fields being made available as rapidly as possible, and the entire project was completed the early part of June. Inasmuch as this constitutes the first step taken by the village toward the accomplishment of an ultimate plan to provide municipally-owned parking facilities in all business districts as building expansion in such sections requires it, it was deemed proper that appropriate ceremonies be held in connection with the formal opening of these parking fields for public use, and the week commencing June 17th was, by proclamation, designated for such celebration, with formal dedication taking place on June 23rd.

During the development of this portion of the general parking plan, the village purchased for $7,000 additional property for an extension of one of the parking



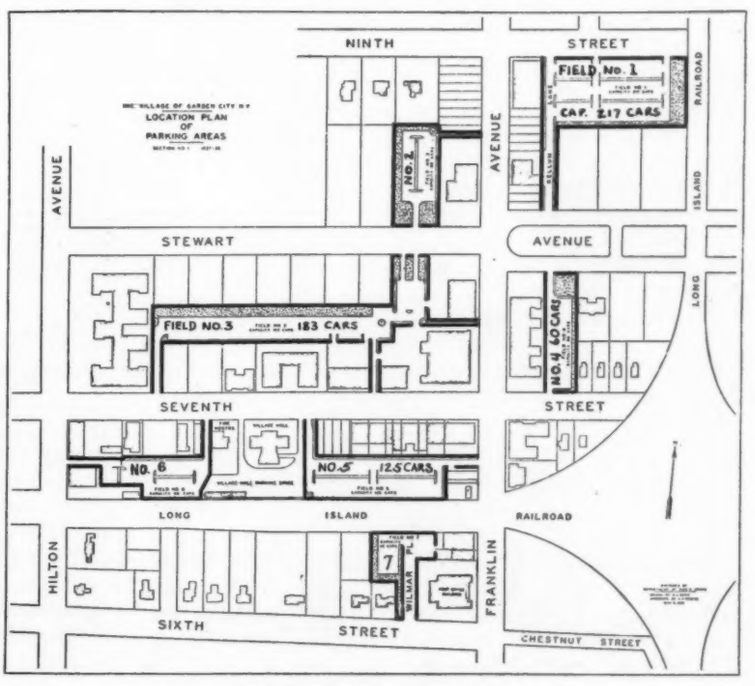
View looking northeast across Parking Field 1. This field designed primarily for department store patrons and employees, no commercial use at present. Field originally designed for 90 cars but extended during development of project as mentioned in text. Street in foreground was originally 15' in width, but was widened to 30' and provides access to this field from important thoroughfare immediately to the south.

Airplane view of business section of Garden City, showing parking areas

fields located therein, and authorized the sum of $6,000 for its improvement, which amounts also are to be raised by bond issue except for five per cent included in the current budget. The village also acquired, by gift and purchase amounting to $1,500, additional property for another parking field in the vicinity of the post office, improvement of which will be at general village expense and probably from current appropriations.

The present seven parking fields comprise about 8½ acres and have a capacity of 775 cars. Construction work included the demolition of one residence and several garages, the excavation of 6,800 cu. yds. of topsoil and excess fill, the construction of 12,017 lin. ft. of reinforced concrete curb and 19,435 sq. ft. of either concrete or macadam sidewalk, and the surfacing of 28,774 sq. yds. with a minimum of 5″ compacted cinders treated with a primary application of tar and sand, and a surface application of either emulsified or cutback asphalt and dolomite screenings. It is planned to subsequently retread the approach driveways with 1½″ plant-mix bituminous macadam.

Several unusual features have entered into the design of these parking fields, dictated by our belief that they should be as attractive and convenient as possible, an asset rather than a nuisance to abutting residential property, free from the necessity of attendants or other than routine policing, usable by delivery trucks without interference to patrons, provide for all-night parking for those fields in the vicinity of apartment houses, and preserve our own zoning regulations. All front-yard set-backs required for buildings by the zoning ordinance have been observed, this set-back in some instances amounting to 75 feet. All areas not used for parking or driveways have been attractively landscaped, and dense screening planted on those sides of the parking fields adjacent to residential property. This alone involved the planting of some 300 trees and several thousand shrubs and hedge plants, all of which were obtained from the village nurseries. Each field has been treated in an individual manner, to retain as far as possible a natural appearance and yet meet the needs of the business property benefited. Existing trees were maintained wherever possible, and incorporated into the layout of the particular parking field. Either landscaped islands or attractive wood fences have been used to indicate the termination of the parking zones, and these, coupled with a minimum number of standardized signs, have eliminated the necessity of parking



Parking areas in Garden City

Entrance to Parking Field 2, which field was also designed primarily for department store patrons and employees. Field abuts residential property on north and west sides. 5' sidewalk on near or store side of field leading to same street as entrance driveway, with additional 5' sidewalk, not shown, leading at right angles from field to main business thoroughfare.

lines, attendants, etc. Several fields, in their present stage of development, have considerable capacity for expansion, the sections not immediately required being landscaped.

Where parking fields were immediately in the rear of business buildings requiring rear-door deliveries, a combined sidewalk and ramp was constructed permitting delivery trucks to back up to the rear door of the stores, and parking is prohibited along this walk. As little frontage as possible was acquired, and an effort was made to keep the access driveways away from points of congested street traffic. Both one-way, two-way, and divided driveways have been used. In several instances five-foot walkways were constructed from the parking fields to the main business street, to make these fields more accessible to the stores on the opposite side of the thoroughfare and so avoid driving from one field to the other. Interior drives of adequate width have been provided in all parking fields, and sidewalks constructed as barriers between parking lanes, to avoid as far as possible the dented bumpers, mudguards, and human tempers that have been one objection to mass parking heretofore. These walks are sufficiently wide to permit their use even with car overhang from both sides. Ornamental lighting has been provided.

Comment has been made that Garden City, in developing a distinctive and original system of municipal parking fields, is setting a pattern for business districts in the towns of the future. A store built last year with show windows and a main entrance facing one of the parking fields as well as the principal business thoroughfare, has more customers enter from the parking field than from the street. This may be prophetic of the future, when modern retail structures in suburban communities and small cities will have their principal entrances and most elaborate window displays facing interior parking fields.

The general plan and the detailed layout and construction plans were prepared under the direction of the author, and the entire construction project was handled by regular personnel and equipment of the Department of Public Works.

Cement Joints for Cast Iron Pipe in Florida

Punta Gorda, Fla., in 1937, completed construction of a water supply system which brought water four miles from Alligator creek to a treatment plant in the city. This four miles was laid with 12″ cement-lined "Mono-cast" centrifugal pipe.

This was a PWA job and most of the labor was new to this kind of work, for which reason the contractor desired long lengths with few joints and a self-centering bell. In fact, neither the contractor nor any of his foremen of crews had ever laid any cast iron pipe before. To reduce cost, Portland cement was used for making joints, with a lead slip joint every 800 ft. to allow for expansion and contraction. Cement joints had never before been used for cast iron pipe in that vicinity, but have proved very satisfactory. The cost, including yarn, cement and labor, was slightly less than 1ct. per foot.

Cost of Repairing Broken Hydrants

The June issue of PUBLIC WORKS mentioned that in a Massachusetts city it cost $676.58 to repair thirteen fire hydrants which were broken during 1937 by skidding or carelessly driven automobiles—an average of $52, plus lost water, per hydrant. In presenting these figures we asked whether any are available on the cost of restoring "breakable joint" hydrants. In response to this we have received the following information. The names of the Massachusetts city and the other city referred to will be given on request:

A typical instance of the results of an accidental smashing collision of a "Safetop" hydrant was recorded in an Ohio city some time ago. The accident occurred late at night and it was not found necessary to rush an emergency repair crew to the scene because the compression-type inlet valve was kept tightly seated by the water pressure in the main and there was no loss of water.

The Superintendent of Maintenance reports that the following morning the repairs to the hydrant were completed in 22 minutes after the arrival of the men on the job, the damage being confined entirely to the standpipe breaking ring and the stem coupling, replacements for which cost $6; and no excavation was required, nor was it necessary to shut off the water supply while replacing the broken parts. From previous experiences with repairing other types of hydrants, it was assumed that two men would be required to make the repairs, but it was found that one man would have been sufficient.

In this instance (which has been duplicated in several other reported collisions), the total labor and parts cost of repairing the hydrant was therefore considerably less than $10. This represents a saving of more than 80 per cent of the cost of repairing standard one-piece hydrants; without considering the value of the water frequently lost, and the lengthy interruption to fire protection which usually follows breakage of such hyrants. These hydrants (the original breakable joint hydrant, introduced by Kennedy in 1932) during six years of service have not usually been damaged by impacts received, being designed to be fully as strong as standard one-piece standpipe hydrants.

Recovery for Sewer Contract Work

Sewer work was done under a contract for $200,000. A reappraisement of benefit assessments resulted in a reduction of the assessment in $11,230. The city failed to pay the contractor the balance due on the contract price due to this reduction. The contractor sued the city for the amount. The Indiana Supreme Court held (City of Gary v. Pontarelli, 9 N. E. [2d] 86) that the city could not complain of the insufficiency of the notice to property owners of the adoption of the assessment roll to defeat recovery, and that the reappraisements, from which no appeals were taken, were final. Judgment for plaintiff was therefore affirmed.

Design and Operation of an Institutional Sewage Treatment Plant

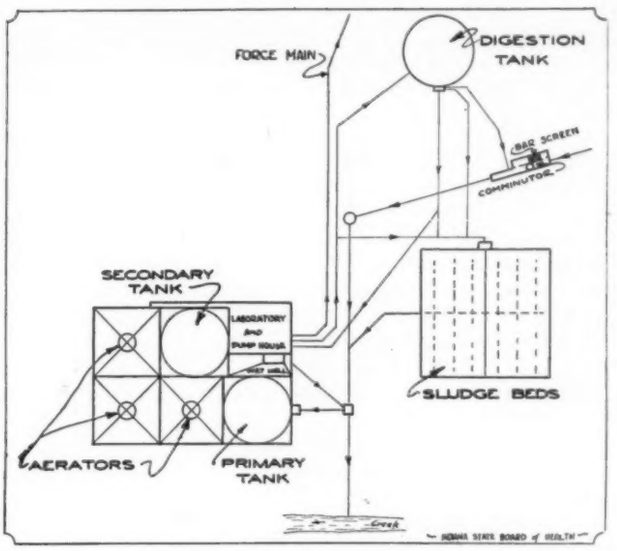
By B. A. POOLE and P. J. KLEISER

Chief Engineer and Engineer, Indiana State Board of Health

ON August 17, 1937, the Evansville State Hospital placed in operation an activated sludge type of plant for the treatment of the sewage originating in the institution. This plant was designed by L. S. Finch, consulting engineer, of Indianapolis. This hospital is a State institution for mental cases and has an approximate population of 1,300 people. The new treatment plant has been designed to treat the wastes for an ultimate population of 1,700 people, estimated to contribute 370,000 gallons of sewage per day. It is of interest that this institution maintains a central kitchen, operates its own laundry, pasteurizes its own milk and operates a slaughter house.

Description of plant: Sewage is collected in a sanitary system which receives sufficient roof drainage to cause severe fluctuation of the rate of flow into the sewage plant. On December 7th, 8th and 9th, 1937, the average rate of flow was approximately 85 gpm, dropping during the night as low as 35 gpm for a period of 3 consecutive hours, while the maximum rate of flow was approximately 185 gpm, which is equivalent to a rate of approximately 266,000 gallons per day—more than twice the average rate of flow. Momentarily higher rates of flow occur, for the plant is located so near the institution that the effect of dumping a tub in the laundry, for example, can readily be noted at the sewage plant. During rainy periods rates as high as 400,000 gallons per day have been noticed.

The sewage, after being conducted to the plant site by gravity, passes directly into a structure equipped with a 10-inch comminutor, and a bar screen installed for emergency measures. The sewage, after passing through the comminutor, flows through a venturi flume and thence into a primary settling tank 24 feet square, having a side water depth of 7 feet, equipped with Dorr mechanical sludge removal mechanism. This settler provides for a 2-hour detention period at the average design flow of 370,000 gallons per day.



Layout of treatment plant

The flow from the primary tank enters 24 foot square, hopper-bottom aeration chambers, the conducting passes being so arranged that the primary effluent can enter any of the three aeration chambers singly or in combination. The aerators provide a detention period of approximately 7 hours, based on the average design flow plus 25% return sludge. The mechanical aerator equipment, made by the Chicago Pump Company, recirculates the liquor from the bottom to top by the use of propellers installed in draft tubes. All three aerators

TABLE NO. 1

ANALYSIS OF SAMPLES COLLECTED AT EVANSVILLE STATE HOSPITAL SEWAGE TREATMENT PLANT

		OXYGEN DATA				*ANALYTICAL DATA*					
Location of	*Hourly for*	*Temp.*	*D.O.*		*5-Day*		*SOLIDS p.p.m.*				
Sampling Stations	*24 Hours*	*Deg. C*	*p.p.m.*	*% Sat.*	*B.O.D.*	*pH*	*Total*	*Volatile*	*Susp.*	*Vol. Susp*	*Remarks*
Primary Inf.	Aver.	22	3.5	40	345 p.p.m.	7.8	880	...	218	182	Av. Flow 90 GPM.
9 A. M. Dec. 7 to	Max.	32	4.6								
8 A. M. Dec. 8	Min.	19	2.2								
Primary Inf.	Aver.	22	3.0	34	252	7.8	834	383	166	140	Av. Flow 78 GPM.
9 A. M. Dec. 8 to	Max.	30	4.6								
8 A. M. Dec. 9	Min.	19	1.0								
Primary Eff.	Aver.	21.5	0.4	4	245	7.5	750	...	96	90	Ax. Flow 105 GPM.
9 A. M. Dec. 7 to	Max.	24	0.8								
8 A. M. Dec. 8	Min.	19	0								
Primary Eff.	Aver.	20	0.1	1	170	8.0	725	300	76	60	Av. Flow 93 GPM.
9 A. M. Dec. 8 to	Max.	25	0.4								
8 A. M. Dec. 9	Min.	17	0								
Final Eff.	Aver.	17	1.7	18	16	..	543	...	18.5	16	Av. Flow 90 GPM.
9 A. M. Dec. 7 to	Max.	18	2.6								
8 A. M. Dec. 8	Min.	15	0.6								
Final Eff.	Aver.	16	1.8	18	10	7.2	585	161	9.5	8.5	Av. Flow 78 GPM.
9 A. M. Dec. 8 to	Max.	17	2.8								
8 A. M. Dec. 9	Min.	15	1.2								

TABLE NO. 2

PERCENT REDUCTION TABLE

Composite Sample Collected	Parts per Million	A. Primary Inf.	B. Settled	C. Final	Percent Reduction A-B	B-C	A-C
Dec. 7-8	5-day B. O. D.	345	245	16	29	93.5	95.4
Dec. 8-9	5-day B. O. D.	252	170	10	23	94.1	96.0
Dec. 7-8	Total vol. solids	...	...	..	..	...	...
Dec. 8-9	Total vol. solids	383	300	161	22	46.0	58.0
Dec. 7-8	Susp. solids	218	96	18.5	56	80.7	91.5
Dec. 8-9	Susp. solids	166	76	9.5	54	87.5	94.3
Dec. 7-8	Vol. susp. solids	182	90	16	50	82.2	91.2
Dec. 8-9	Vol. susp. solids	140	60	8.5	57	85.8	94.0

utilize 3 h.p. motors, the first two recirculating at the rate of 3,500 gpm and the third one at the rate of 1,900 gpm. Each aerator is operated by time switches. With the present flows, only two aerators need to be operated. Aerator No. 1 is normally operated 8 minutes on and 2 minutes off and aerator No. 2 is normally operated 6 minutes on and 4 minutes off.

The aerated liquor flows to a final settling tank, 26 feet square, equipped with Dorr sludge removal mechanism. This settler provides 3½ hours detention based on average design flow, and a surface settling rate of 685 gallons per square foot based on the design flow plus 25% return sludge. The activated sludge settling out in the final clarifier is pumped to a sludge division box which is so designed that it is capable of discharging from 0 to 200 gpm of sludge to waste or to the return sludge line which discharges near the outlet of the primary settling tank.

The sludge digestion tank has a capacity of 5.5 cu. ft. per capita. At the present time it is open, but it is so designed that a floating cover can be installed. The supernatant liquor may be drawn off from several different depths and discharged to the incoming sewage, or to a sludge bed which has a capacity of one square foot per capita, based on the designed population, and is divided in halves.

The final effluent flows into a receiving well, where it is pumped to an open ditch flowing in a westerly direction into Pigeon Creek. As an emergency measure, the wet well is equipped with an overflow which discharges to a ditch located south of the plant.

The service building is built of brick and the laboratory walls have been built of hollow construction filled with mineral wool for insulation. This type of wall construction was adopted in order that the laboratory could be economically heated with electricity. The heating unit is a portable thermostatically controlled electric heater. All equipment can be controlled from a switchboard located in the control room of this building.

The plant is so designed that it allows for flexible operation and was constructed at a cost of approximately $43,000.

Tests: The specifications included a performance test to be carried out under the supervision of the State Board of Health to determine whether the aerators would meet the guarantees, which essentially called for a reduction of 85% of the 5-day B.O.D. present in the settled sewage entering the aerator, and that the power consumption of the aerators was not to exceed 0.40 kwh per pound of 5-day B.O.D. removed.

On the 7th, 8th and 9th of December composite samples were collected of the primary tank influent, primary effluent, and the final effluent. The analyses of these two 24-hour samples are tabulated in tables No. 1 and No. 2 accompanying this article. These show that the B.O.D. of the raw sewage is higher than would be anticipated from such an institution; also that the B.O.D. reduction between the settled and the final effluent was 93.5% and 94.1%.

The average rate of flow from 9 A. M., Dec. 7, to 8 A. M., Dec. 8, was 90 gpm, and the average rate from 9 A. M., Dec. 8, to 8 A. M., Dec. 9, was 78 gpm.

Power consumption: On the days of the test the power consumed by the two aerators in use averaged approximately 3.6 kwh. Aerator No. 1 was operated 80% of the time and Aerator No. 2 was operated 60% of the time. Table No. 2 shows B.O.D.'s of 245 and 170 ppm for the primary effluent, against 16 and 10 for the final effluent. Converting these ppm values to actual pounds, these reductions amount to 248 and 147 pounds of B.O.D. removed. The power used for the first 24-hour sampling period amounted to .35 kwh and .59 kwh for the second 24-hour sampling period, or an average for the 48-hour test of .44 kwh per pound of 5-day B.O.D. removed. This is slightly higher than the guarantee, but the percentage of B.O.D. removal was higher than required by the guarantee, and it is obvious that it requires more power to remove the last few pounds of B.O.D. than it does to remove the first few pounds.

The institution power plant furnished D.C. power and in order to supply A.C. to the treatment plant, A.C. generators were installed, driven by V-belts from the fly wheels of the D.C. generators.

The mechanical equipment at this plant, with its required horsepower, is as follows:

Comminutor	1 H.P.
Aerators	3 H.P. (each)
Primary clarifier	¾ H.P.
Final clarifier	1 H.P.
Lift pump (2) 500 gpm	7½ H.P.
Sludge return pump	1 H.P.
Primary sludge pump	5 H.P.

This plant is operated under the supervision of the chief engineer of the institution; an inmate being provided for full-time attendance with duties confined to general cleaning and pump operations. With the exception of a 20°C. incubator, the laboratory is adequately equipped to run the necessary control tests.

Research on Treatment of Pickling Liquors

The iron and steel industry has recently founded, through the American Iron and Steel Institute, a fellowship at Mellon Institute of Industrial Research, at Pittsburgh, Pa., for the purpose of developing a method of treating or processing the waste liquor of pickling plants so as to render it entirely safe for discharging into streams and of recovering from it chemicals from which useful products can be made economically. The work will be headed by Willard W. Hodge, professor of chemical engineering at West Virginia University and director of its Engineering Experiment Station, who has been granted a year's leave of absence from the university for this purpose.

Recovery for Sewage Damage

An action of trespass against a county for permitting sewage to flow on plaintiff's land from the defendant's infirmary or poor farm without compensation was defended on the ground that plaintiff's predecessor in title had recovered for damage to the land by defendant's appropriation. The Illinois Appellate Court held (Johnson v. Cook County, 8 N. E. [2d] 220) that the action was barred by plaintiff's predecessor's recovery, which, under the state constitution, encompassed past, present and future damages to land because of its permanent injury.

Construction of an open reservoir at Caracas

Concrete conduits under new highway bridge at Caracas

Water Works Development in Venezuela

By HARRY CHAPIN PLUMMER

VENEZUELA has an area of 358,123 square miles, exceeding the combined surface of the New England and Middle Atlantic States, Virginia, Ohio and Kentucky. The population is approximately 3,500,000. It is a land with a labor problem the reverse of ours: the demand exceeds the supply. And while this country and most of the other nations of the world are undergoing a period of acute financial stringency, South America's northernmost republic is enjoying a full continuance of the prosperity we experienced prior to 1928 and which we thought we had recaptured in 1935 and 1936.

Thirty years ago a one-time president, Cipriano Castro, fled the capital, Caracas, leaving behind in the national treasury "assets" of exactly twenty-eight *bolívares*, the equivalent of less than six dollars in the prevailing exchange levels of the time. But by 1919 Venezuela had cancelled the last of her indebtedness to foreign bondholders, and a distinguishing feature of the present governmental policy in the carrying out of public improvements is an absolute refusal to consider whatsoever foreign underwriting of the projects or the contracting of any portion of the works outside the country's frontiers, saving such engineering and machinery equipment and other supplies as cannot be produced there and the occasional engagement of foreign technical experts. These latter are required to work under the supervision of the engineers of the Ministry of Public Works, the newly created *Dirección de Aqueductos*, or Aqueduct Board, or other administrative entity. They are brought in not so much for what they may contribute to the advancement of a given job as for the purpose of affording native engineers and technicians working in association with them opportunity to study the latest and most efficient methods and principles in practice in this country and in Great Britain and on the Continent.

Engineers who go from the United States to aid in public works development in Venezuela are impressed by the difficulties presented by the steep grades and the consequent soil erosion caused by the heavy annual rainfall over the major areas of the country. Throughout the more populous regions of the country which, like Caracas, are on the *llanuras*, or mountain plateaus 5,000 feet above sea level, the surrounding mountains offer perennial sources of waterflow, which the federal government now is trying to harness and to husband against the dry semester, while guarding against the physical damages wrought in the other half of the year, when an innocent brook or gully within an hour or two becomes a raging torrent and when even steep-sloped city thoroughfares take on the aspect of natural river courses.

So not only must the utmost skill be exercised in planning and operations, but the material to be employed in aqueduct construction must be of the best, the strongest and most durable.

Exports from the Port of New York for all the Venezuelan ports increased in volume from $18,850,000 in 1935, to $34,000,000 in 1937 and reached its peak of $4,200,000 in December of last year and registered $3,500,000 and $3,800,000 respectively in January and February of this year. These exports include aqueduct piping, conduit mains and water works materials, oil piping and drilling equipment and automotive material. An average of two hundred motor-cars per week has been maintained since the first of this year and on two days of early March the Ford Motor Company dispatched to Venezuela by its own ships four hundred cars within a forty-eight hour stretch.

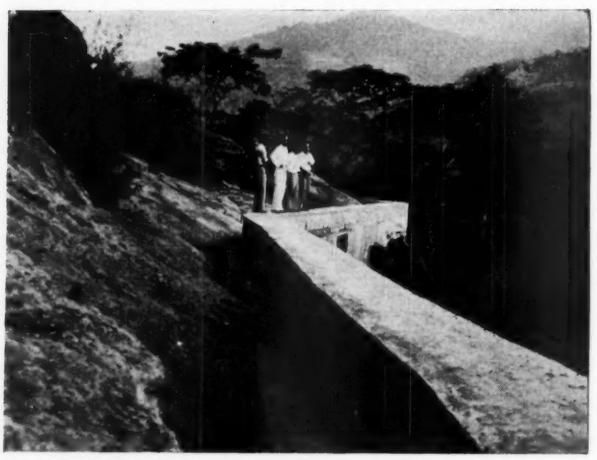
A glance at some of the current water works improvements in Caracas will afford an idea of the magnitude of the public works program in its relation to the quarter million of the city's population. The number of water consumers increased from 13,897 on July 1, 1936, to 14,694 on October 31, 1937. Following the establishment of the *Dirección de Aqueductos*, June 20, 1936, a corps of inspectors was put to work checking the water census of the city, and much unnecessary waste was found.

Distributing reservoirs are established at strategic locations throughout the city's environs. The largest, "El Calvario," has a capacity of 9,500,000 litres, from

Roofed storage tanks, with screened ventilators

which service is maintained over what is termed the "middle network." "El Polvorín," 4,000,000 litres, distributes over the "super-high network." "El Guarataro," 3,000,000 litres, serves over the "lower network." "El Matadero," 2,000,000 litres, supplies the suburban area of "El Paraiso." The first three are fed by "La Toma de Macarao," which furnishes an average supply of 250 litres per second, which is pumped to it by three hydraulic pumps, each of which bears the name of a personage or date in history or one of the poetic appellations so favored by the Venezuelans. The largest of the pumps, that known as the "19 de abril," has a discharge capacity of 86 litres per second against a head of 105 meters. "Petión" discharges 35 litres per second against a 60-meter head. One pump serving the Cimenterio del Sur (Southern Cemetery) discharges only six litres per second against a 68-meter head into a tank having a capacity of 100,000 litres built upon a mountain slope. All the water so pumped reaches a reservoir at the pumping station "San Martín," to be elevated again to the reservoir of Macarao. Three pumps elevate underground water to the distribution tanks of "El Calvario." Small pumps of 2½ h.p. furnish water for flushing the public drains of the city.

Work is now proceeding with the installation of the second of two "Florida" pumps, which have a capacity of 45,000 litres per hour against a head of 58 meters to reservoirs 140 meters distant, from which a booster station (to be built) will distribute the water through a main 125 mm. in diameter, mounted upon concrete posts made necessary by the contour of the terrain. A storage reservoir without roofing, but surrounded by walls of 2.5 meters in height, will have a capacity of 100,000 litres. In the fashionable new residential suburb of Sabana Grande, complete piping and 200 roof tanks with iron covers will be provided, which will be supplied by 490 meters of 110 mm. pipe, through which the pumping station "La Florida" will supply a tank of 500,000 litres capacity.



Combined aqueduct, retaining wall and provision for future highway near Puerto Cabello.

These major public improvements are being carried out not only at Caracas, but in other populous regions of the country. The Ministry of Public Works is now engaged in planning for like operations in areas and communities which hitherto have had only the most primitive water supply systems and sanitary measures. The equipment and materials for all of this construction and extension will come, as in the past, chiefly from the United States.

Suggestions for Primary Sludge Pumping

The subject of pumping sludge from sedimentation tanks to digesters was discussed at the recent meeting of the Illinois sewage plant operators at Elmhurst, and a summary of the conclusions is given by editor W. H. Wisely in "The Digester," published by the Division of Sanitary Engineering of the State health department. These were as follows:

1. Insufficient or delayed pumpage of primary sludge allows digestion to start in the primary tank and results in large chunks coming to the surface. Too frequent or too much pumpage of primary sludge puts much excess water through the digester, resulting in (a) waste of heat, (b) interference with digestion, (c) excessive amounts of supernatant, (d) poorer quality supernatant, (e) thin digested sludge.

2. The best pumping schedule for each plant must be determined by trial and experience. Many factors, such as (a) type settling tank, (b) character of sewage, (c) working hours of personnel, (d) season of year, (e) kind of pumps, etc., are involved.

Where an operator is in attendance only during the day, common practice is to pump sludge early in the morning and again just before leaving in the late afternoon, the length of pumping varying widely.

3. Rate of sludge pumpage is important. Rates of 35-50 gpm appear most common, as there seems to be no "pulling" of sewage through the sludge blanket at these rates. However, higher pumping rates are reported satisfactory at Kankakee, Rockford, Elgin and Chicago Heights, where cross-collectors with flight type mechanisms are employed.

Remember that the rate of supernatant discharge is equal to the sludge pumping rate where fixed-cover digesters with no storage tank are used. This is another reason for pumping slowly at such plants.

4. Operation of sludge collection machinery is important. "Center-scraper" mechanisms are usually operated continuously but "flight" type mechanisms are frequently operated only 30 to 60 minutes before, and during pumping of sludge.

Where there are only 2 or 3 pumping periods daily, flight mechanisms should be operated sufficiently often and long to prevent "belching" up of chunks of sludge when the mechanisms are started.

5. Accurate sampling and detailed laboratory work on primary sludge is highly valuable. Such data make possible positive determination of digester loading and can be used to excellent advantage in explaining digestion upsets.

A schedule that may work satisfactorily at one plant may be completely out of order in yours. Keep at this problem until you arrive at a pumping schedule that keeps the primary tanks clean, yet minimizes the amount of excess water discharged to digesters with raw sludge.

Protection of Subcontractor and Materialmen on Public Works

THROUGH the efforts of the New York Credit Men's Association, acting in conjunction with other interests representing subcontractors and materialmen in the State of New York, there was enacted at the 1938 session of the New York Legislature a statute officially designated as Chapter 707 of the Laws of 1938, popularly known as the Pitcher Act, which became effective July 1. With the enactment of this legislation, New York State falls in line with the federal government, and practically every other state in the United States, in affording to subcontractors and materialmen on public works the protection of a bond conditioned for the payment of moneys due persons supplying contractors or subcontractors with labor and materials employed and used in carrying out contracts with the State of New York for the construction of public improvements. It is believed that this law will reduce present annual credit losses on state contracts of over $1,500,000 to a very small figure and be a definite stimulant to construction.

The statute protects all state contracts the specifications for which require the successful bidder to post a bond for payment of the claims of subcontractors, laborers and materialmen. The inclusion of this requirement in the specifications is discretionary with the State Comptroller, but he has advised the Credit Men's Association that payment bonds will be required by him in practically all cases.

The form of bond has been promulgated by the Comptroller and approved by the Attorney General whereby protection is afforded to any person entitled to file a mechanic's lien against the public improvement. By the Lien Law any person performing labor for, or furnishing materials to, a contractor, his subcontractor or legal representative, for the construction of a public improvement, pursuant to a contract by such contractor with the State, is entitled to file a lien for the principal and interest of the value or agreed price of such labor or materials, upon the moneys of the State applicable to the construction of such improvement, to the extent of the amount due or to become due on such contract.

As used in this act, "Public improvement" includes the erection, alteration or repair of any structure upon, connected with, or beneath the surface of any real property belonging to the State, and any work done upon such property, or materials furnished for its permanent improvement; any work done or materials furnished in equipping any such structure with any chandeliers, brackets or other fixtures or apparatus for supplying gas or electric light; the drawing by any architect, or engineer, or surveyor, of any plans or specifications or survey, which are prepared for or used in connection with such improvement; the value of materials actually manufactured for but not delivered to the real property; the reasonable rental value for the period of actual use of machinery, tools and equipment, and the value of the compressed gases furnished for welding or cutting in connection with the erection, alteration or repair of any real property.

"Contractor" means a person who enters into a contract with the State for a public improvement.

"Subcontractor" means a person who enters into a contract with a contractor and/or with a subcontractor for such public improvement, or with a person who has contracted with or through such contractor for the performance of his contract or any part thereof.

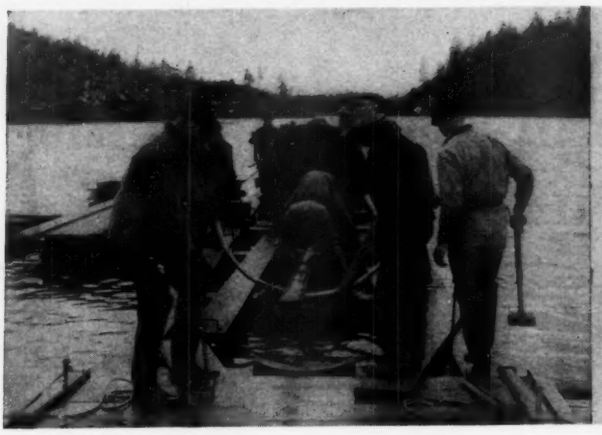
"Materialman" means any person who furnishes material, or the use of material, tools, or equipment, or compressed gases for welding or cutting, either to an owner, contractor or subcontractor, for such public improvement; and one who "furinshes material" means and includes the reasonable rental value for the period of actual use of machinery tools or equipment and the value of compressed gases furnished for welding or cutting.

Before securing any rights or benefits under the act, a materialman or a subcontractor who furnishes labor or material to the principal contractor must file and enforce a mechanic's lien pursuant to the provisions of the lien law. Such notice may be filed at any time previous to thirty days after the construction of a public improvement has been completed and accepted by the State. The notice must be filed with the head of the department or bureau having charge of the construction and with the State Comptroller, and must give the name and address of the lienor, name of contractor or subcontractor to whom labor or material was furnished, amount claimed, date when due, description of the public improvement, amount of labor and materials furnished, and of materials manufactured for such improvement but not delivered; a general description of the contract; if the lienor is a partnership or a corporation, the names of the partners, and its business address, (if a foreign corporation its principal place of business within the State); if the name of the contractor or subcontractor is not known to the lienor, it may be so stated in the notice; and the notice must be verified by the lienor or his agent.

The lien continues for 6 months from the time of filing the notice, unless an action to foreclose the same is commenced within that time and a notice of the pendency of such action is filed with the State Comptroller, unless an order be made by a court of record continuing the lien and a new docket be made stating such fact. Any court may make an order continuing any such lien for a period not exceeding one year.

In the notice of lien, the State, the principal contractor, the surety on the bond and all other lienors should be made parties defendant, and judgment may be entered in the foreclosure action directly against the surety company. Laborers must enforce not only a mechanics lien but also their rights under the Labor Law.

Funds received by a contractor or subcontractor for a public improvement constitute trust funds, to be applied first to the payment of the claims of subcontractors, laborers and materialmen arising out of the improvement, and to the payment of premiums on surety bonds filed, and premiums on insurance accruing during the making of the improvement; and any contractor or subcontractor or agent of same who applies, or consents to the application of such funds for any other purpose and fails to pay the claims of subcontractors, laborers and materialmen arising out of the improvement is guilty of larceny and punishable under the Penal Law.



Close-up of the 60 inch pipe building crew. Note stave raft at the left

The completed 60 inch pipe across Lake Aberdeen, with water level at normal

Building An 84 MGD Industrial Water Supply System

By S. C. WATKINS

Water Superintendent, Aberdeen, Wash.

IN September, 1936, the city of Aberdeen, Wash., had an industrial water supply that was unused, the two industries which it was built to supply never having reached the operation stage.

The 1936 pulp plant expansion program of the Grays Harbor Pulp Co., which was located in Hoquiam (which lies just west of Aberdeen, the two cities being practically one at the boundary line), demanded more water than that firm's own system could supply without extensive rebuilding. Consequently, in September of that year a contract was arranged between this company and the cities Aberdeen and Hoquiam which provided for supplying 30 mgd, with an option on not to exceed 10 mgd additional, to be furnished from Aberdeen's idle supply.

This system had been well planned and constructed to supply large quantities of high-quality water, not potable, at very low rates. It comprises a semi-submerged intake in the Wynooche river, from which the water enters a settling basin and screen chamber, and from this a concrete-lined tunnel 3 miles long, with a gravity flow capacity of 84 mgd, which discharges into a storage and sedimentation basin known as Lake Aberdeen, which has available storage capacity of 200 mg and is fed also by several small creeks. From the lake a 54″ creosoted Douglas fir pipe line 2.5 miles long brings the water to the area where the two industrial plants had expected to operate.

To supply this water to the Grays Harbor Pulp Co., the city of Aberdeen installed 6 miles of 54″ wood stave pipe to the Hoquiam boundary and about a mile in the city of Hoquiam. This line crossed under 14 railroad tracks, over two navigable waterways on high trestles, by a 450 ft. submarine crossing under the Wishkah river, in trenches through 2 miles of paved streets, and about 1400 ft. was laid through an operating lumber mill yard.

The first mile of this line was constructed through semi-marshy ground on cedar cradles with cedar mud sills for bearings. In trenching, ¾ yd. and 2 yd. hoe-type excavators were used and cleaning up was done with a ⅜ yd. shovel. Stumps and logs embedded in the ground presented difficulty. Tide floods rose as high as 3½ ft. above the trench bottom, and quantities of both ground and surface water entered the trench. (Normal precipitation during the rainy season amounts to 14 to 25 in. a month.) It was necessary to solidly sheet more than a mile of trench.

In the 54″ pipe assembly 33 staves of 2 x 6 in. high grade live Douglas fir, creosoted, were used, with bands of one-piece ⅝ round steel spaced 5 to 10 in. apart. Four pipe-building and four banding crews were employed, the former consisting of a pipe builder, 3 chiselmen, 4 stave passers and 4 hammermen. A banding crew consisted of 3 band placers and 6 cinchers. Water, mud and other troubles prevented rapid progress, but under good conditions the crews erected about 400 ft. in 8 hrs. in several places.

Submarine Crossing

The steel submarine crossing under the Wishkah river was placed in a trench, and supported on 2-pile timber bents, capped and cradled. At its lowest point the pipe was 11 ft. below the river bed and 36 ft. lower than where it entered the river channel. Trenching was done with a 1½ yd. clamshell dredge, the silt and sand excavated being piled along the trench for backfilling and the excess removed in hopper-bottom scows.

The supporting piles were driven in the trench with a floating pile driver, bents 10 ft. centers, minimum penetration 20 ft. below bottom of trench. Divers cut off the piles to grade, drift-bolted 10 x 12 caps on them, and spotted the cradles in position. Grade for cutting piles was given by stretching a piano wire at the cut-off line along the row of piles.

The 54″ steel pipe was placed in four sections averag-

ing 120 ft. long, being lowered onto the cradle with the hoists of the dredge and pile driver combined. The sections were joined with Dresser couplings by divers, and were held together by anchor bolts attached to lugs welded to the pipe back of the coupling. The pipe was anchored in the cradles by a steel band passing around it, one end extending down and lag bolted to each pile. After leakage tests with a ¾ in. meter (which indicated negligible leakage) the trench was backfilled with the clamshell dredge.

Lake Aberdeen Bypass

The run-off to Lake Aberdeen from a watershed of about 5 sq. mi. containing several small creeks supplies a water which, while of a quality acceptable for ordinary newsprint pulp, is not of so high a quality as that of the Wynooche river that is brought to the reservoir through the tunnel, and the pulp company agreed to pay premium rates for this better quality water. Accordingly water from the tunnel is bypassed around the lake to the pipe below the dam. For this purpose an 82 x 66 x 60 steel wye was built into the outlet portal of the tunnel, the 60″ branch connecting to a 60″ wood stave bypass line, while the 66″ was blanked off for the present but can be used for another pipe line or to supply the reservoir.

The bypass is 4,000 ft. long from the wye to the 54″ distribution main below the reservoir. The upper 1,200 ft. traversed a soft, swampy area, and the lower half-mile crossed the lake. The gradient of the pipe line from intake to pulp mill was only .047% and could not well be flattened across the lake, wherefor the pipe is partially submerged. To facilitate assembling it, however, the lake was lowered temporarily 3 ft. Both in the lake crossing and across the swampy area at the upper end the pipe is constructed on pile bents, spaced 10 ft. centers, two red cedar piles supporting a 12 x 12 red cedar cap, which in turn supports a cradle and extends out on each side to provide 12″ walkways.

The pipe staves have a net thickness of 2½ in., are 8 to 24 ft. long, and 37 were used per section. They were

Steel transition section at Lake Aberdeen end of the 3-mile tunnel

cut from live green logs, A grade, of old-growth Douglas fir with some sap wood allowed; kiln dried to 18% moisture content and then finished to final true dimensions. They were then given a "Wolmanizing" treatment to prevent decay, fungus growth and termite action: this process consisting of impregnating the wood, by a vacuum and pressure process, with salts of sodium fluoride, arsenate, dinitrophenol and neutralizing chromates, securing not less than 0.3 lb. of dry salt per cu. ft. of timber. After again kiln-drying to 18% moisture, the staves returned to their proper dimensions.

Delivery of staves, bands and other material from

54″ steel pipe at east end of submarine section under Wishkah river.

the shore to the assembly was by rafts towed by a 9 hp. outboard motor on a 4 x 16 ft. flat bottom scow. The rafts were made of a timber frame supported on 50 gal. oil drums, three rafts on 10 drums each for staves (capacity 1800 ft. b.m. each), and two 6-drum rafts for bands. Loaded rafts were tied alongside the trestle during construction. The assembling crew consisted of two chiselmen outside and one inside the pipe, four stave passers and four hammermen; the banding crew of three banders and six cinchers. Two follow-up men tested the bands, set the side cradles, and placed, at 20 ft. intervals, bands passing over the pipe and lagged to the piling below the caps. This crew erected as high as 18,000 ft. b.m. of staves, or 330 ft. of completed pipe in an 8-hour day.

The entire work was completed April 10, 1937, and from that time the system has continuously delivered the contracted 30 mgd and has a reserve for future requirements of this plant and to supply 54 mgd without further expansion; and can, by simple booster arrangement, supply an additional 80 mgd at very low cost.

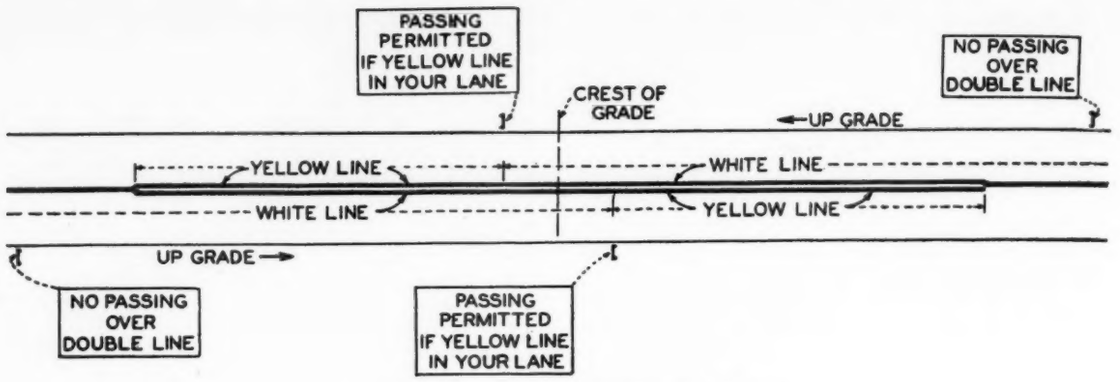
Organization

Original surveys, investigations, preparation of plans, and construction of the first two units in 1927 to 1929 were carried out under the general direction of the writer, with the assistance of Grant Ross, city engineer, and J. L. Stannard (deceased), consulting engineer of Tacoma, Wash., with R. E. Bullard, K. C. McFarland and A. M. Torpen as assistants. The writer, with C. E. Putnam of Tacoma as principal assistant, had full charge of the design and construction of the later units.

The intake, sedimentation basin and tunnel were constructed under contract by the Siems Carlson Co. of Spokane, Wash. at a cost of about $650,000. The earth fill dam, creating Lake Aberdeen, clearing and grubbing of the flooded area, and construction of the first 54-inch pipe was done by the Wright Construction Co. of Seattle, Wash., at a cost of about $530,000.

The 60 inch by-pass line across Lake Aberdeen was constructed by the Water Department of Aberdeen by day labor, under the direct supervision of the writer, at a cost of about $37,000.

The 54-inch extension, except the submarine portion, was constructed by the Macri Co., excavation contractor, and the Federal Pipe and Tank Co., pipe contractor, both of Seattle, at a cost of about $260,000. The submarine pipe was constructed by the Twin Harbor Dredging Co. and The Grays Harbor Construction Co. jointly, with Arthur McCray of Seattle as submarine diver, at a cost of about $28,000.



How California Speeds Up Traffic With Safety

Double Traffic Line Permits Passing on Crests of Grades

ON 2-lane or 3-lane roads, a central line restricts passing at curves and on hills. PUBLIC WORKS has repeatedly pointed out that when a vehicle has cleared the crest of a hill and can see that the road ahead is clear, it should be permitted to pass. There is no better nor safer time to pass a heavy truck than at this point before the truck has gathered speed after the ascent. By the time it has reached the end of the average double line, the truck is running 50 or 60 miles an hour, and passing is more hazardous; but if the truck is not passed, it means crawling up the next hill behind the truck.

To meet this situation, the California State Division of Highways has adopted the use of a yellow line placed over one line of the double white stripe.

The original marking at points of limited visibility of sight distance on two-lane pavements with the "NO PASSING OVER DOUBLE LINE" signs and corresponding white double lines, restricted traffic to the use of only one lane for the entire length of the double stripe. The observance of this double line has been excellent. Motorists recognized that it was placed on crests and horizontal curves, where the visibility was limited, for their benefit. However, when they had passed the crest, under the terms of the Vehicle Code, if the way was clear there was no reason why they should not pass over the double line and continue on the descending grade, passing the slow moving vehicles ahead of them.

But in passing such slow moving vehicles on the descending grade, it was necessary to cross over the double white line, despite the signs reading, "NO PASSING OVER DOUBLE LINE." In order to meet this situation and "to give the correct information at all times with no signs to bluff the motorist," the Division of Highways began experiments to determine the best method to advise the motorist that passing on down grade or at the end of horizontal curves was permitted.

The methods used elsewhere were studied and tried out. From the results of these experiments, the yellow line was selected and is now being placed over one line of the double stripe, beginning at the crest of a grade and continuing on the descending grade to the end of the double line.

Signs are also being placed at the point of beginning of the yellow line, advising the motorist that passing is permitted if the yellow line is in his lane. This method of marking not only gives the motorist the permission to pass if it is safe to do so, but it continues the use of the double line, and if any confusion exists as to whether it is a double white line or a white and yellow line, and the motorist does not pass, he will always be on the safe side.

At those locations where the visibility is restricted and the passing might be dangerous, the double white line will continue to be used.

On three lane highways, the double striping at crests of grade to give one lane up and two lanes down, will continue as it is now used.

Signs reading, "PASSING PERMITTED IF YELLOW LINE IN YOUR LANE" will be placed at the crest near the beginning of the yellow line.

Concrete Pavement Slab Warp Studies

Studies of highway concrete pavement distortion were made recently in California by C. S. Pope, construction engineer of the Division of Highways. These were reported in *California Highways and Public Works*, official publication of the Division of Highways. Conclusions derived from studies are:

1. Pavement warp or distortion occurs after each increase or decrease in moisture content of *adverse soils* and is more or less continuous. (Adverse soil is a term used herein to describe any soil which will change volume with the addition or substraction of contained moisture.)

2. Texas reports many miles of pavements laid on adverse soil warp badly at joints and elsewhere at times.

3. Minnesota reports 9 per cent of its concrete pavements warps either from ice lenses or swelling soils.

4. This State also reports that if soil is already at plastic limit, additional water will not swell the soil but ice lenses which will distort the pavement will form.

5. Drainage trenches under expansion joints proved ineffective to prevent warp in tests made in Minnesota, Missouri, and California.

6. Equalizing moisture in subgrade of adverse soils reduced warp in Missouri, Kansas, Minnesota, Texas, and California.

7. Heavy impervious paper laid on adverse subgrade in contact with pavement proved of no value since rupture of the paper often occurred at joints which then admitted water.

8. Oil mixed with adverse soil (grade not given) increased moisture holding capacity and swell of soil.—Minnesota.

9. Tar at 1½ gallons per square yard laid on adverse subgrade in contact with pavement proved of no value in Minnesota, as did heavy asphaltic oil, Grade E, in California since rupture of this type of membrane at joints admitted water.

10. Gravel 12 inches to 24 inches thick under pavements in Minnesota prevent warp but in California 12 inches of gravel proved ineffective at Williams, and it is thought that 18 inches to 24 inches will be needed on bad soil if membrane is not used.

11. Copper seals at joints were ineffective in Minnesota and California to prevent leakage at joints and subsequent warp of pavement.

12. Warp has been prevented in Kansas and Missouri by keeping subgrade of adverse soils at plastic limit moisture content.

13. Warp has been reduced in Minnesota by repouring expansion joints with softer asphalts. California found such treatment not permanent where asphalt seals are used.

14. California has prevented warp, where due to moisture change in adverse soil, by constructing a bituminous blanket of 7/10 gallon per square yard of E grade asphalt on the subfoundation, covering same with a rolled course of nonswelling imported borrow usually 9 inches thick, and constructing concrete pavement thereon.

15. California has relieved warped concrete pavements by bringing the subfoundation to uniform moisture content or by placing on the pavement a cushion course of nonswelling, well-cemented crusher run base not less than 4 inches in thickness and constructing thereon a surface of not less than 3 inches of cut-back plant-mix or asphalt concrete.

Experimental Bituminous Mat Construction

THE Missouri State Highway Department, in order to study the methods of constructing bituminous mats and their durability, several years ago constructed 28 test sections, each about ½ mile long, by road mix methods, using three aggregate gradations (coarse, medium and fine) and various percentages of powdered asphalt (from 0 to 25 per cent by weight of oil) with each aggregate gradation. A few experiments were made with variations in construction procedure.

During construction, observations were made of the workability, uniformity, consistency and compactibility of each mixture and of the effect of different methods of construction. Numerous condition surveys were made during a period of about three years following construc-

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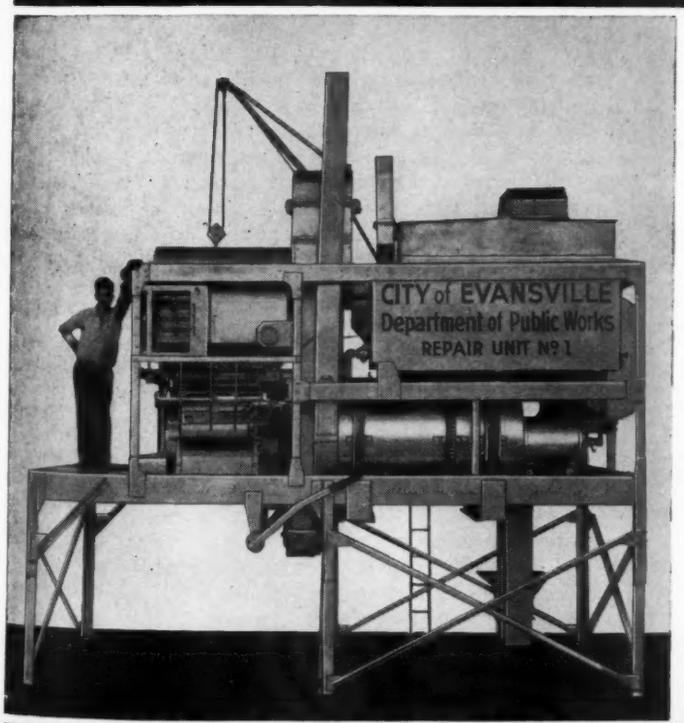

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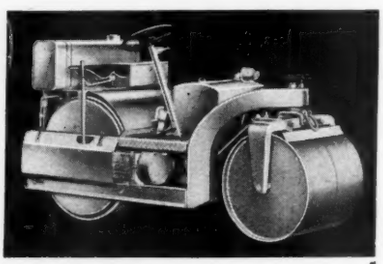

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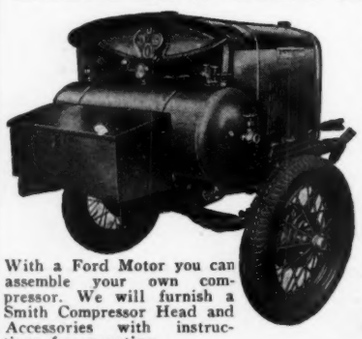

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tion to determine the relative service given by the test sections. Cost analyses were made for the various combinations of materials and methods of construction.

Among numerous conclusions, the most outstanding were:

1. Dense well-graded aggregate is more satisfactory for oil mats than coarse-graded open aggregate, probably because the resulting mat, being tighter and closer sealed, is more stable and less inclined to pit and ravel or allow the entrance of water.

2. It is economical to improve the gradation of the aggregate to the extent investigated in this project, since the increase in quality of the mat is apparently worth more than the increase in cost.

3. The use of powdered asphalt in amounts from 10 per rcent to 20 per cent by weight of the oil in the mix apparently improves the quality of the bitumen and results in a better sealed, cohesive mat.

4. The advantage of using dense, well graded aggregate is apparent with any proportion of powdered asphalt up to 20 per cent by weight of the oil.

5. It is possible to construct excellent oil mat with either fine or medium-graded aggregates using powderd asphalt, but mats constructed with coarsely graded aggregates are much inferior regardless of the proportion of powdered asphalt used.

6. Under conditions such as existed in this investigation it is not economical to use powdered asphalt with coarsely graded aggregate since the bituminous binder cannot be sufficiently improved by this means to make it suitable for open type surfaces.

7. The optimum amount of powdered asphalt for the type of road oil used on this project appears to be from 10 to 15 per cent by weight of the oil. Greater proportions apparently result in a bitumen of too high viscosity for satisfactory workability in mixing. Furthermore, mats containing large amounts of powder tend to become brittle, and as a result are subject to early disintegration through checking, cracking, pitting and ravelling.

8. It is economical to use powdered asphalt in the amount of 10 per cent by weight of oil with medium and fine-graded aggregates since thereby the resulting mat is improved sufficiently to warrant the increase in cost. Possibly the use of 15 per cent powdered asphalt might be economical, but larger amounts apparently result in reduced quality of the mat and are not considered satisfactory.

9. The bitumen should be applied to the entire aggregate windrow and mixed as a whole instead of making two or more separate applications to the split windrow. It is not possible by the road mix method to split the windrow and apply the bitumen in increments and obtain uniform application or prevent segregation.

11. Rolling is intended only for initial compaction of oil mat surface, since final compaction must be accomplished by traffic. Rolling is of value in that it lessons pitting by coarse particles and helps to distribute traffic more uniformly across the width of the mat during initial compaction stages, but its effect is not generally noticeable at later ages.

11. At about $35.00 per mile, rolling is worth the additional cost by assisting in compaction and saving the loss of some material.

Steel Sectional Forms for Culverts

The illustration accompanying the article under this title on page 35 of our June issue was not a futurist picture of a cagy individual. Turn it upside down and you'd be surprised. It was our proofreader's error. Excuse it, please.

When the Road Is Closed for Construction

The reconditioning of the roadbed and paving of a highway called for the closing of the road to public travel. This was done by the construction company for three or four miles. Detours were provided and barricades and warning signs were erected at the termini of the section and at the several intersections with other roads. One barricade of wire rope was located at a point between the initial barriers and warning signs. There were no warning lights at this barricade. A motorist came to his death from driving a motor-truck into the barrier at night. In an action against the construction company and the laborer who erected the barrier, the Alabama Supreme Court, Carter v. Franklin, 173 So. 861, affirmed a verdict for the laborer. The construction company, against which a verdict was rendered, was granted a new trial.

The court said that it appeared the motorist knew that the road was closed, and whether all intersections were provided with adequate warnings as to those who might enter through them without knowledge that the road was closed was unimportant. That persons were finding their way around barricades and using this highway with knowledge that it was lawfully withdrawn from public use for purposes of construction was held to afford no lawful warrant for such practice. The construction company owed no special duty to safeguard such persons from injuries due to conditions attending the construction work. Being in the wrongful use of such premises, injuries directly resulting from such use would be chargeable to such negligent or wrongful act under the same principles, broadly speaking, as apply to trespassers.

Limited Purpose of Surety Bonds

In an action by a subcontractor (1) to foreclose a mechanic's lien for materials which became part of the construction of a public improvement, and (2) to recover from the contractor and its surety, the Standard Accident, upon a bond given to the Triborough Bridge Authority, the amount due to the subcontractor from the contractor, the New York Appellate Division (W. J. McCormack Sand Co., Inc. vs. Edward D. W. Milligan, Inc., et al., 300 N. Y. S. 789) dismissed the complaint as against the surety. The bond ran only to the Triborough Bridge Authority and, it is held, is solely for its protection. Further, no statute permits recovery by the subcontractor upon such bond. Action was brought in the Indiana courts on a bond by a state highway contractor under the statute which requires the bond so that those furnishing material to a contractor or subcontractor may receive payment for such material. It appeared that a subcontractor purchased material from a dealer, who ordered plaintiff to ship it to a certain destination. Plaintiff charged it to the dealer. The subcontractor paid the dealer in full. The Indiana Appellate Court (Republic Creosoting Co. vs. Foulkes Contracting Co., 8 N.E. (2d.) 416) held that plaintiff could not recover from the general contractor and the bondsman for material furnished. The court said that it could not be inferred from the statute that when material used in such a construction is paid for in full by the subcontractor the bond covers one who has sold the material to the one from whom the subcontractor purchased it. The bondsman's duty is to see that material furnished for the improvement is paid for.

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A New Stage in Illinois River Pollution Abatement

FOR more than a generation municipal, State, Federal, and indirectly international, efforts have been directed toward abating the pollution of the Illinois river. The steps taken have included increasing dilution by withdrawing water from the great lakes, clarification of Chicago's sewage, both domestic and industrial, and to a minor extent, the clarification of sewage from other communities and industries. Protests from the other states and from Canada resulted in Federal orders that Chicago reduce the amount of water withdrawn from the lakes and so treat its sewage that, even with the reduced amount of dilution, no nuisance would be created. The treatment works of the Sanitary District of Chicago designed to comply with this will be ready for operation by January 1, 1939; on which date the diversion of lake water must be reduced to 1500 cfs. to comply with the order of the Supreme Court.

Many other communities contribute to the pollution of the river, but while a few of these are treating their sewage before discharging it into that stream, most of them have argued that the pollution they contribute is insignificant compared with that of Chicago. A State Sanitary Water Board was created in 1929 to prevent, control and abate stream pollution and was vested with certain definite authority for effecting this. The policy of the Board has been first to exhaust all possible means to procure voluntary abatement before resorting to legal measures. In persuance of this policy the Board asked all municipalities on the Illinois river to send representatives to a meeting which was held in Chicago on April 26th, to discuss and plan for action by them in securing further abatement of pollution.

In addressing this meeting, C. W. Klassen, technical secretary of the Board and State sanitary engineer, said: "With the (1) Sanitary District of Chicago's program nearing completion, (2) in the face of decrease in diversion from Lake Michigan, (3) with the abatement of the industrial pollution already 75 percent completed, and other industries actively engaged in waste treatment projects, and (4) pollution abatement on all tributaries practically completed, the final step in the Sanitary Water Board's program of sanitation and conservation of the Illinois River now definitely rests with the municipalities on that stream. Already considerable progress has been made by some of those municipalities, and the Board has set January 1, 1939 as the date when all municipalities on that stream must show active progress on a plan or program to reduce their share of the wastes now entering that stream."

"The sanitary conditions of the stream following this decrease in diversion (of lake water) can not definitely be forecast, but from all indications the permissible pollution load will be lower following the decrease in diversion than at the present time because of the probable reduction in natural purification ability of the river. To prevent critical conditions subsequent to January 1939 it is obvious that settleable organic solids capable of producing sludge deposits must be removed to the greatest possible extent. In addition, an appreciable reduction in non-settleable organic matter is indicated if natural purification agencies are to be expected to keep pace with deoxidation."

The Board already has made some progress in securing the cooperation of cities other than Chicago. At the present time on the Kankakee river the city of Kankakee has in operation a new sewage treatment works. Momence has engineers employed making a survey and report on the proposed sewage treatment works. Bradley is considering either the construction of a municipal plant or a connection to the new treatment works at Kankakee; the final decision on this will be made in the near future. Wilmington has been advised of the need for early progress. On the Fox river, all municipal sewage is now receiving treatment except that from the small village of East Dundee, which recently has been ordered by the Sanitary Water Board to construct a treatment works. In addition, institutions and industries have completed their treatment works. On the Little Vermilion, Mendota, the only sewered municipality, has under construction a new treatment works replacing the former obsolete plant. On the Vermilion, Pontiac has completed and has in operation a sewage-treatment works. Streator is faced with an early decision on the employment of engineers in regard to the construction of their treatment plant, the interceptors for which are now definitely planned and ready for construction. On the Sangamon, both Springfield and Decatur have sewage treatment works in operation and Monticello has a plant under construction.

Seventeen municipalities were represented at this meeting, and those present were apparently unanimous in agreement on the desirability of the action urged by the Board, some, however, pleading financial difficulties. In discussing these Mr. Klassen said:

"There has been considerable discussion on methods of financing, many with the impression that additional legislation is necessary. These statements are, in general, based upon a lack of thorough study and knowledge of the existing laws in this State in regard to financing sewage treatment works. General obligation bonds, with which you are most generally familiar, must be approved by referendum and their issuance is limited within the constitutional provisions and limitations of 5 percent of the assessed valuation of the community and by statute (with few exceptions) to 2½ per cent of that valuation. Legislation passed in 1936 allows Illinois municipalities of less than 5,000 population to increase the 2½ percent debt limit to the constitutional limit of 5 per cent, provided the proceeds from the bond issue are to be used for sewerage improvements.

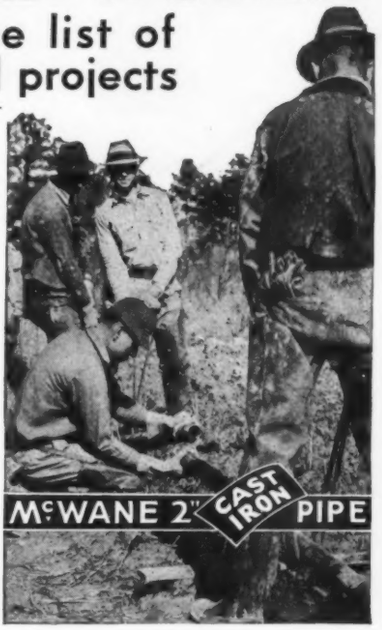
"Special assessment bonds is another method and as the name implies are retired by assessments against the property, such being based on benefit derived. Such bonds can be issued *without* approval by the electorate.

"Sewerage revenue bonds, issued under the 1933 Sewerage Revenue and Service Charge Law, differ basically from these other plans in that they are retired solely by sewer service charges or so-called "rentals" paid by the users of the sewer system, the amount paid being dependent upon a schedule of rates designed to apportion the charges according to the degree of service rendered. The revenue thus obtained must be adequate to operate and maintain the sewerage system, provide a depreciation fund, retire the principal and pay interest on the bond issued. Delinquent bills for sewer service constitute a lien upon the property served. Approval of the issuance of sewerage revenue bonds by referen-

MILLIONS AVAILABLE
for PUBLIC WORKS

*WATER WORKS

heads the list of
approved projects



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dum is not a requirement. However, a referendum becomes mandatory if petitioned for, within 10 days after publication of the ordinance, by 15 per cent of the voters in the last preceding municipal election for the presiding official of the governing body of the municipality.

"The combined water and sewerage revenue law is similar in form and administration to the sewerage revenue law, but under this plan the water and sewerage systems are thereby combined and operated as a single utility. Many advocates of the sewer revenue plan look upon this as a logical combination with the payment designed as a 'utility charge.' Both of the above service charge laws are applicable to cities, villages and sanitary districts of less than 500,000 population.

"The fact that a municipality does not own its water supply is not an obstacle in the way of sewer revenue bond financing for one of the most successful sewerage revenue bond financed sewage treatment projects is in a municipality not owning its water supply.

"There is also the possibility of the formation of a sanitary district under the 1917 Sanitary District Act and at the present time there are 24 such districts in Illinois and this method of financing sewage treatment works has certain advantages, depending entirely on local conditions.

"The first step in a municipality's program is the employment of competent engineers to make a study of the problem for on such a study should be based not only the engineering considerations in the location and design of a treatment works and intercepting sewers but also the financing plan. In this connection, the engineers of the Sanitary Water Board will be glad to meet with any of the city councils or local groups and discuss in detail their situation and problems."

Clarke Gardner

An Appraisal of Community Improvements in Salisbury

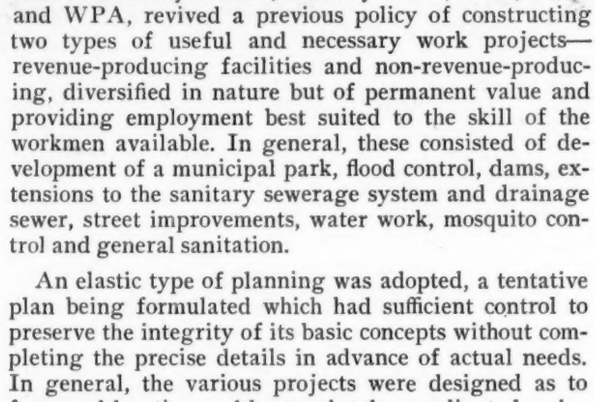
By CLARKE GARDNER
City Engineer, Salisbury, Md.

SALISBURY, Maryland, on the Delmarva Peninsula, is a city of 13,000 population, a large portion of whom are dependent for their livelihood upon seasonal enterprises, such as production and sale of agricultural commodities, manufacture of farm packages, canning products and construction of various types of public works.

Beginning in 1934, an acute condition of unemployment became prevalent, particularly among those engaged in seasonal employment, and to meet this situation the city officials, aided by CWA, ERA, PWA and WPA, revived a previous policy of constructing two types of useful and necessary work projects—revenue-producing facilities and non-revenue-producing, diversified in nature but of permanent value and providing employment best suited to the skill of the workmen available. In general, these consisted of development of a municipal park, flood control, dams, extensions to the sanitary sewerage system and drainage sewer, street improvements, water work, mosquito control and general sanitation.

An elastic type of planning was adopted, a tentative plan being formulated which had sufficient control to preserve the integrity of its basic concepts without completing the precise details in advance of actual needs. In general, the various projects were designed as to form and location and harmoniously coordinated as integral features of a well balanced plan. These projects are classified into two general groups — immediate projects and future projects. The proposed public improvements are as follows:

1. Proper numbering of dwellings, buildings, etc., in conjunction with the erection of street name signs for the purpose of identification.
2. Completion of property map records.
3. Street improvements, including opening and widening of streets, curbing, guttering, surfacing and drainage facilities.
4. Protracted study of traffic conditions and the elimination of traffic hazards.
5. Landscaping and beautification projects along public thoroughfares, public plots and parkways.
6. Low cost housing program, under the provisions of the Federal Housing Act.
7. Weed eradication, mosquito control and general sanitation.
8. Further development of Municipal Park, including recreational facilities.
9. Development of a playground for the colored population.
10. Sewage disposal plant, intercepting sewers and a continuation of sanitary sewer extensions.
11. Incinerator for garbage disposal.
12. Extension and further development of waterworks facilities.
13. City Hall and Municipal Building.
14. Municipal Airport.



Timber bridge, lagoon with riprap shores, Municipal Park.

Curbing and gutter, with street improvements.

The activities undertaken under this program from January 1, 1934, to March 1, 1938, are of seven different classes and are as follows:

1. Municipal Park—This, comprising 70 acres in the heart of the city, has been developed into an outstanding recreational center. The improvements include improved roadways, lighting, tennis courts, shrubbery, trees, placing of rustic benches, and construction of a pavilion and bandstand; grading, widening and extension of a natural lake with protection to the shore lines, and protection of the shore slopes from erosion by erecting concrete-steel bulkheads and placing rip-rap. Total cost of the work, $173,000.

2. Water Supply and Distribution—Improvements under this head includes (a) A 12″ double casing gravel-pack well 60 ft. deep in Municipal Park, capacity 1.6 mgd by pumping test. (b) Brick and concrete pumping station with motor-driven turbine pumping unit, with automatic shut-off device and remote control operated from the Main Street station. (c) Elevated storage tank, 300,000 gal. capacity, on steel tower and concrete foundation, surrounded with attractive concrete retaining walls. (Also similar walls were placed

around another city storage tank.) (d) Extensions to the distribution system, totaling 28,595 ft. of 14″ to 4″ castiron mains and 36 fire hydrants. Thus augmented, the water system can furnish an ample supply for domestic and fire fighting purposes for an increased population. Total cost, $115,000.

3. Flood Control—In August, 1933, a flood of unusual magnitude had caused considerable damage which affected waterfront properties along the Wicomico river, and it was decided to construct a dam designed to permit a discharge of 8,400 c.f.s., predicated on a total drainage area of approximately 42 sq. mi. This was a gravity-type structure 300 ft. long, of reinforced concrete on timber piles sealed with sheet steel piling. (Incidentally, this was the outstanding work project constructed in this vicinity.) Total cost, $95,000.

4. Sanitary Sewer Extensions—Sanitary sewers extended to various sections of the city totaled 53,797 ft. of 36″ to 6″ of vitrified clay pipe, with 100 manholes and 550 house connections. These will materially assist in the elimination of cesspools and other unsanitary conditions. Total cost, $150,000.

5. Storm Water Drainage—Construction of a total of 37,661 ft. of 27″ to 10″ concrete drainage sewers, including 230 drain grates, has assisted in relieving some of the acute drainage problems of the city. Total cost, $130,000.

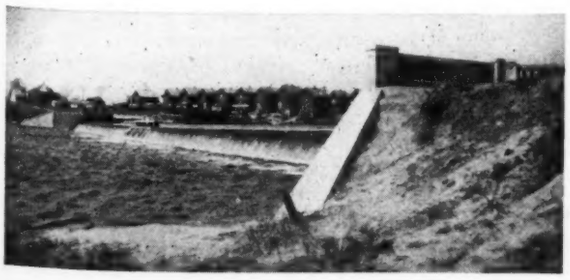
6. Mosquito Control and General Sanitation—Two sluggish streams were cleared of undergrowth, giving improved drainage and eliminating several nuisances and contributing largely to relieving conditions detrimental to public health. Total cost, $17,000.

7. Street Improvements—Construction of curbs, gutters and sidewalks, with some grading and surfacing, has improved the general appearance of the streets and the drainage of several sections. This work included 28,000 lin. ft. of combined concrete curb and gutter, 6,000 ft. of concrete gutter, 4500 sq. ft. of concrete sidewalk, 2 miles of street grading and 3 miles of surfacing. Also the widening of main thoroughfares, and construction of long-radius curbs at certain intersections. Total cost, $47,000.

The total costs were divided between Federal and sponsor's funds as follows:

Description of Project	*Federal Funds*	*Sponsor's Funds*	*Total Cost*
1. Municipal park	$150,000	$23,000	$173,000
2. Water supply and distribution	40,000	75,000	115,000
3. Flood control	85,000	10,000	95,000
4. Sanitary sewers	90,000	60,000	150,000
5. Storm water drainage	80,000	50,000	130,000
6. Mosquito control & sanitation	15,000	2,000	17,000
7. Street improvements	35,000	12,000	47,000
	$495,000	$232,000	$727,000

Of the sponsor's funds, $185,000 is self-liquidating—used for water works and sewers. The remaining $47,000, used for other purposes, was carried partly as general taxes and partly as special assessments.



Reinforced concrete dam 300' long.

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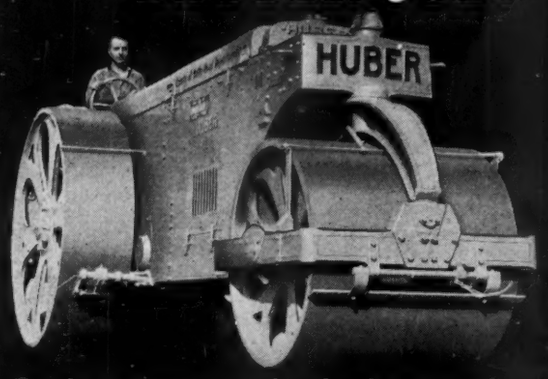

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"Genuinely Friendly"

When writing, we will appreciate your mentioning PUBLIC WORKS.

The workmanship and quality of this work has been exceptionally good, due to the splendid cooperation of the district administrator, Brady J. Dayton, and the WPA personnel with the city administration, which organized a highly efficient supervisory personnel, who have shown unusual initiative and willingness and instilled a spirit of keen competition among the several WPA crews.

In discussing the relative merits of work relief, as compared with the so-called dole system, there is no doubt that a continuation of useful public works is more desirable for the following reasons:

1. Constructive employment of the unemployed will prevent the loss of technical skill, raise the hope and self-reliance of the individual.
2. Work means wages—reasonable wages means security—a condition that will provide a mental balance and some sense of direction.
3. Work creates an active and healthy mind, which in turn is reflected in the morale of the individual and the community.
4. The initiation and completion of necessary work projects will add to the health, comfort, safety and general welfare.
5. Various types of public works and public services are absolutely necessary in order to keep pace with the development and progressive growth of any community.

The dole system may be termed objectionable because:

1. Persons receiving the dole would, in a majority of cases, lose the incentive to work.
2. The creation of such an environment would certainly have a tendency to lower the morale and self-respect of the individual.
3. The community as a whole would suffer from the lack of aggressiveness which in turn would prove a stumbling block to progress.

Since this work began, the economic condition of the city has improved, as indicated by bank check clearances and increase in property values and salability. The city audit shows a total book surplus for the fiscal year ending Sept. 30, 1937, of $907,850, as compared with a surplus of $679,679 for the fiscal year ending September, 1933; and this does not include a complete valuation of public works completed in conjunction with Federal agencies. We cannot but feel that well planned community improvements do add to the local wealth and well being and in most instances are worth what they cost.

When a Barricade Is Unnecessary

A boy of 11 sued construction contractors for negligently leaving on Elm Street, Troy, Alabama, an obstruction dangerous to passers-by. While bicycling along the street plaintiff, to avoid being run into by an automobile behind him, ran into a barricade and was injured. The contractors were engaged in completing the approaches to a bridge or viaduct and the obstruction was a barricade and detour sign placed across the street to protect the work of construction. The barricade had been moved to one side, leaving a space for vehicles to pass along Elm Street.

The defendants' evidence tended to show that the work had not been entirely completed, that they were hauling dirt to fill in the sides of the approach and that the partial opening of Elm Street at the barricade was to allow trucks engaged in hauling dirt for that purpose to pass.

The Alabama Supreme Court (Goodwyn vs. Gibson, 177 So. 140) held that if the barricade was maintained by authority of the city, or other public authority having jurisdiction, and was necessary for the protection of the work and the public in connection therewith, it was not negligently left on the street. But if the work had progressed so far that the barricades were unnec-

essary, and they were removed from the streets leading into Elm street, and these streets were opened to the public, and the Elm Street barricade was unnecessary, the inference would be authorized that the act of leaving the barricade in the street was negligent.

State Highway Finances

THE following is a brief abstract (prepared by the Highway Research Board) of testimony of T. H. MacDonald, Chief, U. S. Bureau of Public Roads, given before the Committee on Roads of the House of Representatives a few weeks ago.

The mileage of roads under supervision of the State highway departments totalled 274,911 in 1925, while in 1936 this figure had increased to 533,144 miles. Road-user taxes available for State highways exclusive of debt service were $1,010 per mile in 1925, rising to a maximum of $1,740 in 1930 and falling to $750 in 1934 and $745 in 1935. In 1936, road-user taxes available for State highway purposes, exclusive of debt service, were $810 per mile, or less than half the sum available in 1929, 1930 and 1931.

The diversion of $169,000,000 in 1936 very largely tells the story of the difficulties confronting many States in matching their Federal-aid highway funds rapidly. It partially tells the story of the decreased amount of funds available to the State highway departments for the upkeep and extension of their State roads systems. It also indicates the loss of a considerable amount of the road-user taxes that might be available for the very important extension and improvement of secondary roads and city streets.

Our present improved roads will not remain so without constant maintenance and without replacement when they get beyond the condition of economical maintenance, or so obsolete that they are a menace to safe highway transport. The highway system very rapidly would decrease in adequately improved mileage if construction should stop. On the basis of road life studies made in connection with the State-wide planning surveys, if we were to eliminate future construction and reconstruction, by 1960 there would be only 27,000 miles of surfaced roads remaining from approximately 209,800 surfaced miles now in the Federal-aid highway system.

Due to changes in the utilization of our highways it has been necessary to use more units in our construction per mile of roads now than formerly. Although the number of units per mile of highway has been increased, the unit prices have been decreasing and actual costs now are under the costs paid for similar work in the past.

Taking excavation as typical, that is, the movement of earth in cuts and fills, we had in 1923 a high unit price. Using the average of prices from 1925 to 1929 as a base, or 100 per cent, 1923 prices were nearly 33 per cent higher than the base, but in 1937 such prices were only about 65 per cent of the average from 1925 to 1929.

For surfacing, taking the same period from 1925 to 1929 as the base, prices are now about 85 per cent of the base average. For structures the trend has been similar.

The average cost on a nation-wide basis for 20-ft. concrete slabs for the period 1922 to 1929 was $26,693, and the average cost for the period 1930 to 1937 was $20,944.

In the field of bituminous concrete construction the change has not been quite so much. The average cost of bituminous concrete construction for 20-ft. widths during the period 1932 to 1937 was $28,532 per mile with portland cement concrete base, and $20,514 with the bituminous base, the difference between the two figures being in the cost of the base.

FORMULA FOR

BOND-*BURNING*

CEREMONIES

50 YEARS OF SERVICE

St. Paul, Minn., Virginia Ave., has completed a half-century of service. Neither weather nor traffic could best it. "It's still serviceable," says George M. Shepard, Chief Engineer, Dept. of Public Works of that city.

* * * *

Bond-*burning* ceremonies crop out in the news. It's a fine American custom—pleasant comment by civic leaders and happy "asides" among the taxpayers—as the torch is held to the cancelled bonds. And the pavement still good for years of service!

A study of brick pavements in Des Moines by Iowa highway authorities concludes that service will average 36 years; Columbus, Ohio, reports over 500,000 square yards which has already averaged 45 years of service; records of individual pavements run still higher.

The costs of upkeep on brick pavements is very low—often ranges from negligible to nil. The reason: Brick resists damage from weather as well as traffic. As built today it gives a durably smooth, safe passage to any type of traffic. National Paving Brick Association, National Press Building, Washington, D. C.

BRICK

When writing, we will appreciate your mentioning PUBLIC WORKS.

Following is a digest of the important articles published last month having to do with water works design, construction and operation and water purification, arranged in easy reference form.

The Water Wheel

Inhibitors for Corrosion Prevention

USING the marble test with pH measurement, an increase of 0.2 in pH, even in cold water, indicated the water should be treated for corrosiveness. In lime-soda treatment, alkalinity should not be reduced below 40 ppm. The range between corrosive water and depositing water is very narrow; it is better to keep on the depositing side—to renew filter sand than service pipes.

Use of sodium silicate increases alkalinity somewhat, but coating of silicate on the pipes is relied on for corrosion prevention. Ohio surface waters carry 2 to 7 ppm of soluble silica, and ground waters 10 to 15 ppm (one carries 110), so the addition of, say, 8 ppm in treatment should not be objectionable. The use of sodium chromate as an inhibitor may not be objectionable, but so little is known yet of its physiological effects that it cannot be recommended.[A87]

Soil Corrosion of Pipe Lines

CORROSIVE effects vary widely in different soils. In general (in California) adobes and clays, especially if noticeably high in alkali content, are the most corrosive; loams and sandy loams less so, and well drained fine sands least. Soils of marine laid origin and those geologically new and unweathered are among the most corrosive. Cathodic protection may be needed for protection in the most corrosive soils, special protective coatings in those less so, and no extra protection in non-corrosive soils; by testing soils beforehand, designing engineers can route pipe lines to avoid severely corrosive areas, or limit cost of protection to that needed in the several soils encountered. Earth resistivity, the major factor in electrolytic corrosion, is most easily measured with the Shepard earth resistivity meter. Of laboratory tests of soil corrosivity used in the Los Angeles area, the Corfield-Williamson nipple and can test is that most generally used.[A88]

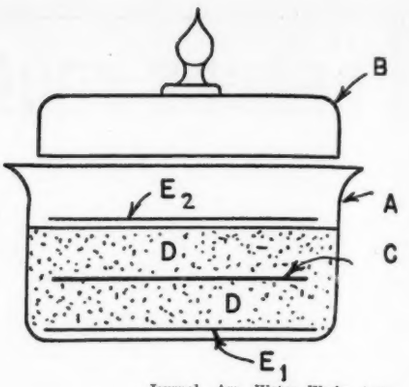
A SHORT (20-hour), direct, accelerated laboratory corrosion test has been developed, using 1.6″ diameter disks cut from sheet steel .004″ thick. A disk is placed in a 2″ diameter laboratory bottle containing 4cc of the dry soil to be tested, half below and half above the disk, to which is added the exact volume necessary to produce the maximum corrosion effect. After 20 hrs. the disk is removed, rust rubbed off with the fingers under a stream of water, and weight of disk compared with that before the test. This test was used to prove that corrosive soils to which alkali was added lost most of their corrosiveness.[A89]

Treating Lumber for Waterworks Structures

FOR LUMBER in or on the ground, coal-tar creosote is unequalled for protection against decay and termites. In other locations chromated zinc chloride may be sufficient, but for most of them creosote is recommended. The most common uses of treated lumber by California water works are for reservoir roofs and wood stave pipe. Creosoted pipe gives a taste to the water for two or three weeks only. Untreated reservoir roofs may last only 4 to 7 years, average life perhaps 15 years, but 45 years for a creosoted roof which would cost perhaps $15 more per MBM. Several cities have experienced taste from condensation water dripping from creosoted roofs, but only for a short time, and only a few cities. It is believed that condensation water from roofs treated with chromated zinc chloride offers no health hazard.[A92]

Swimming Pool Converted Into Filter Plant

LIVE OAK, FLA., aided by PWA, has improved its water work system by building a 200,000 gal. elevated tank, 14,400 ft. of c.i. mains with valves and fire hydrants, a 500,000 gpd softening plant, and two electrically driven pumps, one 300 gpm deep well and one 400 gpm service. Cost $56,280. The former pumps had been steam operated. Near them was an open air swimming pool 40x100 ft. and 9 to 3 ft. deep, on the site most suitable for the new treatment plant, and the plant was built in it, locating two 400,000 gpd gravity, rapid sand filters and mixing chambers in the deep end; the pumping equipment and preliminary settling tank in the center; while 48 ft. at the shallow end was converted into a sedimentation basin. A preliminary settling basin, of steel with conical bottom and Dorr equipment was built adjacent to these. All equipment is electrically driven and the entire plant is practically automatic except the washing of the filters.[F40]



Journal, Am. Water Works Ass'n.

Method of making accelerated corrosion test. A—bottle. C—disk. D—soil. E—filter paper.

The Dual System of Water Mains

DUAL SYSTEMS OF MAINS, as used in Boston for 20 yrs., are credited by D. M. Sullivan with the following advantages: Eliminating roadway openings with their excessive cost and possible damage suits, traffic tie-ups and detouring. Short service connections, with better pressure, stoppages more easily freed and leaks in them more readily located, and the curb cock eliminated. Less expensive to excavate under sidewalk for repairs, and excavations not subjected to pounding of heavy vehicles. Pipes not subjected to stresses and strains due to passage of heavily loaded vehicles over them. Elimination or reduction of electrolysis from street car lines. The dual system is used in all the new traffic arteries around the city.[B17]

In a system of dual mains proposed by A. F. Ballou, the mains would be placed under the sidewalks of one side only—say the north and east sides—and would not be connected at their intersections directly; but a hydrant would be placed at the NE corner of each street intersection and connected to each main. A service header of small pipe would be laid under the W and S sidewalks and connected to the main at each end. There would be a valve in each hydrant connection and one at each end of each service header, and valves in the mains would be at intervals of say three blocks. No single break in a main would put out of commission any hydrant or service header.[B18]

Sterilizing New Water Mains

IN STERILIZING new water mains before putting them into service, the Charleston, S. C., water department places some dry chlorine compound at the end of each joint of pipe as it is laid.

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If chlorinated lime is used the amount is 0.1135 lb. per ft. of 4″ pipe, 0.71 lb. for 10″, etc., based on a dose of 50 ppm of chlorine. If HTH is used the dose is 0.0419 lb. for 4″ pipe, 0.262 lb. for 10″, etc. Wilmington, N. C., proposes to apply high-test hypochlorite through a funnel, inserted in a 1″ corporation cock at one end of a new section of pipe and the pipe be filled with water entering that end and receiving the chemical as it passes the cock; then to stand undisturbed for 6 hrs. It is thought this will give more uniform distribution of chlorine in the water than the other method.[E35]

Bibliography of Waterworks Literature

The articles in each magazine are numbered continously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

A *Journal, American Water Works Ass'n.*
May

86. The Water Works Executive and His Place in a Three-Bathroom Era. By R. Cooney. Pp. 721-735.
87. Prevention of Corrosion by the Application of Inhibitors. By F. H. Waring. Pp. 736-745.
88. Testing of Soils Prior to Installation of Metal Pipes. By R. R. Ashline. Pp. 746-759.
89. A Laboratory Soil Corrosion Test. By V. A. Grodsky. Pp. 760-766.
90. Protection of Metals to Resist Corrosion. By A. A. M. Russel. Pp. 767-772.
91. The Dollars and Sense of Water Main Cleaning. By C. Inglee. Pp. 773-783.
92. The Use of Treated Lumber in Water Works Structures. By D. L. Lindsley. Pp. 784-792.
93. Seasonal Temperature Variations in Relation to Water Treatment. By B. Burnson. Pp. 793-811.
84. Coal Versus Sand as a Filter Medium. By O. J. Ripple. Pp. 812-816.
95. Developments of Rapid Sand Filtration to Increase Capacity. By J. H. Jewell. Pp. 817-826.

E *Engineering News-Record*
June 2

33. Flow of Water Through Pipe Bends. Pp. 777-778.

June 9

34. Surface Water Supply Recommended for Houston. Pp. 818-819.

June 16

35. Water Main Sterilization with Dry Chlorine Compounds. P. 854.

June 23

36. Drains Remove CO2 from Tunnel. Pp. 885-886.

F *Water Works Engineering*
May 25

38. Maintenance and Operation at Leominster, Mass. By N. N. Wolpert. Pp. 726-729.
39. *p*. Kentucky Licensing Plan for Water Works Operators. By F. J. Cheek and F. C. Dugan. Pp. 741-742.

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40. Swimming Pool Converted into Filter Plant. By W. A. Smith. Pp. 784-787.
41. Lime & Copperas Reduce Hardness. By W. Strockbine. Pp. 797-798.

G *Water Works & Sewerage*
June

22. *p*. Bristol's New Filtration Plant. By J. A. Newlands. Pp. 625-628.
23. Special Sprinkling Rates at Natrona. By G. W. Knight. Pp. 636-638.
24. *p*. The Human Element in Meeting Emergencies. By H. W. Niemeyer. Pp. 647-649.

J *American City*
June

15. Water Service and Repair Trucks in Los Angeles. By H. J. Martin. Pp. 41-42.

K *Proceedings, Am. Soc. of Civil Engineers*
June

5. Relation of Rainfall and Runoff to Cost of Sewers. By J. A. Rousculp. Pp. 1151-1165.

M *Canadian Engineer*
May 24

10. Sterilizing Small Supplies. Pp. 18, 20.

June 14

11. Recent Progress in Water Supply and Treatment. By W. M. Wallace. Pp. 11-14.

P *Public Works*
June

27. Collecting Water Samples for Bacteriological Analysis. P. 10.
28. Protecting Exposed Water Mains from Freezing. P. 14.
29. Modern Equipment Reduces Pumping Cost. By H. J. Graeser. P. 20.
30. Standpipe Supplements Pressure-Reducing Valve. By H. S. Peck. P. 20.

Q *U. S. Piper*
June

1. Curtis Creek Crossing with 30″ CI Flexible Joint Pipe. Pp. 19-22, 34.

T *Technique Sanitaire et Municipale*
March

1. Captage des Eaux dans le Lit Sableux des Rivieres. By M. Pinset. Pp. 41-44.
2. Comportement des Nappes Profondes du Bassin Parisien. By A. Vibert. Pp. 45-49.
3. Elaboration et Signification Pratique d'Une Statistique Geologique de l'Eau. Pp. 49, 52.

V *Journal, Maine Water Utilities Ass'n*
June

5. Sodium Silicate Treatment for Water. By A. F. Burke. Pp. 69-73.

Y *Pipe Progress*
June

1. New 16″ Main Suspended under Bridge at Rockford, Ill. By H. S. Merz. Pp. 14-16.

Questions and Answers

Concrete Reservoirs

I would like information on concrete reservoirs. A Superintendent of Water Works from Iowa.

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Ans. For a small water works, or for a small reservoir, a steel standpipe or elevated tank will almost certainly be cheaper than a concrete tank. On the other hand, for a very large reservoir, concrete may be more economical. Generally, concrete is cheapest when the side walls are placed directly on the earth, at about 45° slope, either built in slabs or placed with a cement gun. For vertically walled concrete structures, the most economical depth will generally be under 15 feet. The walls need not be more than 15 inches thick at the top and 18 to 21 inches at the bottom, if considerable reinforcement is used. Cantilever type walls are most economical to the height mentioned above; counterfort above that height. Walls should be designed to resist water pressure, without taking the earth backing into account, with the reservoir filled; and to resist earth pressure with the reservoir empty. Considerable care is necessary with the joints to prevent leakage through them.

Reservoir Construction Data Reservoir Joint Filler

I have heard there was a mix of raw rubber and asphalt for joints in concrete reservoirs. A Superintendent of Water and Sewers in Arizona.

Ans. There are several manufacturers that furnish expansion joint material of rubber and asphalt. We do not know just what kind of rubber is used, but the resulting product is very satisfactory for this type of work. Names of manufacturers will be furnished on request.

Poison Oak Poisoning

Whole families have been affected by the resin of the poison oak that sometimes gets in a man's clothes. Following exposure, clothing should be thoroughly washed with strong laundry soap or dry cleaned with Stoddard solvent. Ordinary water, unless made alkaline by strong soap, will not dissolve the irritating resin, but alcohol will. Inhaling the smoke from burning poison oak has resulted in hospitalization of those exposed to it. One man had his tongue terribly swollen following the burning of poison oak brush. A number of internal remedies are on the market, as well as such lotions as 5% solution of ferric chloride in 50% alcohol, calamine lotion to which enough carbolic acid has been added to make a 2% solution, etc.

Treatment of Tar Burns

Hot tar, generally used in pouring expansion joints and laying composition roofing, can produce most painful and dangerous burns when in contact with the skin. Not only is there considerable destruction of tissue when the material is very hot, but unless the tar is completely removed certain poisons of the phenol group may be absorbed into the blood stream with serious and perhaps fatal damage to the kidneys. Leading English medical authorities recommend the use of trichlorethylene as a tar solvent. A roofing organization in San Francisco uses a mixture of kerosene and gasoline, about half and half. Benzene, carbon tetrachloride and similar solvents will soften the tar and makes its removal easier. All of these should be used with some caution as they dissolve the natural grease of the skin and can cause serious skin irritations. Gasoline and benzene left in contact with the skin for any extended length of time can cause serious burns. All of these products produce fumes which are poisonous in heavy concentrations and they should all be used with extreme care.

Fire Torch Used to Clean Buildings

The brick building shown in this picture has between 12 and 16 coats of paint. When the surface becomes so thickly coated, it is necessary to burn off all the old paint or sandblast it before refinishing.

Building cleaning companies often find 8 to 10 coats of paint on the outer surface of old but valuable buildings. Sometimes it is one-eighth inch thick. Sand blasting costs are high. A blow torch is too slow. Several of these building cleaning companies have discovered a fire tourch does the job quickly and cheaply. Compare these costs:

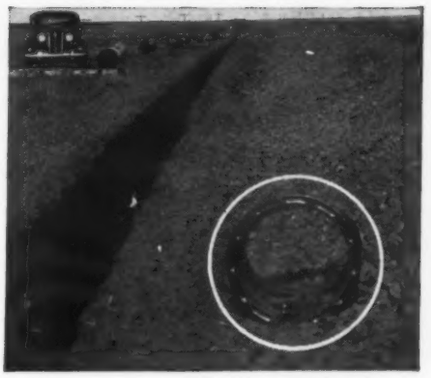
With the fire torch you can cover one square foot of surface in a half-minute or less. One man can cover 3600 square feet in 40 hours working time. The fellow who scrapes off the burnt paint has all he can do to keep up with this pace. Fuel costs only amount to about 36 cents per day. Labor for a 40-hour week would cost about $100.

A painter's blow torch takes three times as long. Labor costs $300. Commercial painters on the job would cost more.

Sandblasting cannot always be used, because on soft brick, it mars the surface. Building cleaning companies tell us, however, sandblasting would cost twice as much as burning with a fire torch.

In addition to these savings, the fire torch can be used throughout the year burning weeds around walks, driveways, fences, thawing out frozen gutters, machinery in the winter time and drying out wet spots in roofs before patching them, etc.—*Elbee Tatler.*

Cleaning building with torch.



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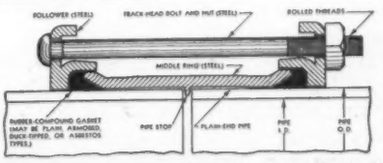

Cross section, Dresser Steel Coupling, Style 38, showing how it joins *plain-end* pipe in a *flexible*, yet permanently tight connection. Sizes available: ⅜" I. D. to largest pipe made.

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A Digest of the Sewerage Literature of the Month giving the main features of all the important articles published

The Digestion Tank

Laying Asbestos Cement Sewer

ASBESTOS CEMENT PIPE was used for laying 7,000 ft. of 18″ sewer in Westchester Co., N. Y. Because of flat grade of 0.08%, and high level of salt ground water, and need for minimum infiltration, pipe that was smooth and resistant to corrosion and infiltration was desired, and bids were limited to enamel-lined cast iron, steel with bitumastic enamel inside and out and wrapped with asbestos felt, and asbestos-cement pipe. Bids for the last were lowest. The pipe were supplied in 13′ sections, which were light enough to be maneuvered easily both above ground and in the trench. Joints were made with collars of the same material, hot asphaltic compound being poured into the annular space, using joint runners; the outside ends of the pipe having first been primed to make the asphalt bond. Excavations had everything from salt marsh to solid rock. Pumping was almost continuous—at very high tide salt water stood 2 or 3 ft. above the top of the trench. As each tangent was completed it was tested to 24 hrs. with a 4 ft. head of water in the pipe, the allowable leakage being 1 gal. per inch of diameter per 100′ per hour. One half of the completed sewer, shortly after high tide and a heavy rain, showed infiltration of only 14.3% of that allowable; the other half, in clear weather, only 3.27%.[G21]

Garbage-Sewage Digestion at Lansing, Mich.

SINCE 1920 Lansing has collected garbage in cans, and emptied and washed them at a central station. A sewage disposal plant is now under construction where the cans will be emptied into hopper-fed hammermill grinders with a capacity of 6 tons per hour, the ground garbage being then transferred to digestion tanks by pneumatic ejectors. The garbage collections vary from 14 to 40 tons (on a dry basis). The sewage from 100,000 is treated in this plant, passing through grit chamber, comminutors, pre-aeration tank (10-min. detention for grease flotation), primary tanks (one hr. nominal detention) with longitudinal sludge scrapers and skimmers, spiral flow activated sludge tanks (6 hrs. aeration) and radial-flow settling tanks, the effluent passing over a white glazed tile weir. Sludge and garbage are digested in 4 tanks, 300,000 cu. ft. combined capacity, heated, with sludge scraping and scum breaking mechanism. Gas is stored in a steel holder of 25,000 cu. ft. capacity giving pressure equivalent to 8″ of water. Waste sludge moisture will be reduced from 99% to 91% in a 1500 gph centrifuge before entering the digesters. Digested sludge is dewatered on a vacuum filter of 200 sq. ft. surface, then discharged into a 60-ton, 6-hearth incinerator, the top hearths for drying, the bottom ones for incineration to ash or drying to 7 or 8% moisture for fertilizer. A 240 hp gas engine operates the blowers. The building is ventilated by fans discharging into either chimney or incinerator forced draught. Glass block panels in the walls and skylights assure good lighting.[E17]

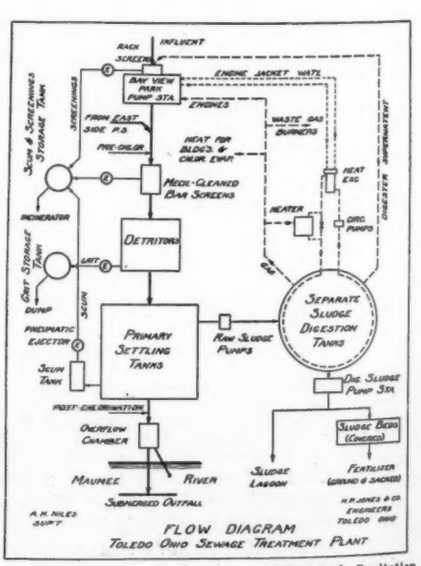
Sludge Gas Engines Save $13,299.36

TOLEDO'S sewage treatment plant, serving 310,000 population, went into operation in 1932, in 1936 installed two 310 hp. gas engines, one driving a pump, the other a 300 hp. synchronous motor used as a generator; with jacket water used to heat the digesters. When current generated is not sufficient to operate the motor-driven pump, additional current is purchased from the Toledo Edison Co. (Digested sludge is pumped to drying beds a mile way.) There is no gas holder or storage capacity. During 1937 the gas engine driven pump pumped 7,052 million gal., against 34 ft. head, using 23,688,200 cu. ft. of gas. The gas engine driven generator produced 344,669 kwh, using 16,674,300 cu. ft. of gas, and 483,200 kwh of current was purchased. The actual cost of power and pumping was $8,927.82 (not including overhead). Based on cost per m.g. of pumping in 1936 with purchased current, this would have cost $22,227.18 if purchased, indicating a saving due to the gas engines of $13,299.36 (less overhead on $38,225, cost of installation.)

It now is proposed to install another gas engine of at least 750 hp connected to a 2300-volt, 277 rpm generator, with 200,000 cu. ft. gas storage, and carry the current by cable through the Maumee river tunnel to the East Side pumping station 3000 ft. away.[H45]

Ferric Chloride Generation at El Paso

GENERATION of ferric chloride for sewage treatment at El Paso has been effected at low cost ($1.90 per 1000 lb. of B.O.D.), but when generators have been running a few hours ferric rather than ferrous [illegible] is produced and free chlorine comes off, due to hydrogen collecting on the iron surfaces, also fine particles of carbon, silica and other impurities in the iron. This can be prevented by stopping the flow of chlorine for a few minutes at frequent intervals, or stirring by hand or mechanically. Both these are decidedly objectionable. Experiments showed that a 12″ x 24″ drain tile used as a generator gave almost as good results as the original tanks of 50 to 60 times the capacity; that a smaller generator can be used with cast iron turnings than with steel turnings, since the former are much smaller and provide much greater surface but contain 5% or more of impurities. It is far simpler to clean several small tanks than one large one. If the chlorine solution passes through a small covered tank with only a short contact period and then through a larger tank, 100% efficiency could be approximated. The writer recommends, for treating 6 mgd, an upward-flow primary reaction tank 18″ x 24″ with gas-tight cover, the solution from this flowing upward through a secondary



Municipal Sanitation

Toledo treatment plant, flow diagram.

Installing U. S. Super-de Lavaud Pipe with mechanical joints for sewerage force main at Annapolis, Md.

The use of cast iron pipe for pressure sewers is steadily increasing. This material, standard the world over for water and gas distribution, offers 5 definite advantages for sewerage service: it effectively *resists corrosion;* it is *impermeable;* joints are *infiltration-proof;* it has great *structural strength;* its *maintenance cost*—little or none. We produce Super-de Lavaud *chill-free* centrifugally cast pipe in sizes from 3 to 24 inches—pit cast pipe in sizes from 3 to 84 inches—in 12-foot, 16-foot or 18-foot lengths. Quick service from stocks carried at 15 shipping points throughout the U. S. A.

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tank about 4 x 4 x 3 ft. deep with a distributing grid in the bottom, and then through a 12″ x 24″ tank where it receives additional chlorine; using cast iron in the primary tank and steel in the secondary. The operation should be at a uniform rate and storage of ferric chloride be provided to permit variation in sewage dosage rate.[H46]

7,000 Foot Ocean Outfall at Miami Beach

THE SEWAGE of Miami Beach, Fla., is discharged into the ocean 7,000 ft. east of the north end of that city through a line of 36″ cast-iron pipe with Mono-Cast Doublex Simplex joints, laid with continuous fall to avoid air pockets, entirely in rock trench with at least 2 ft. of rock cover, using the excavated rock, which has high lime content and cementing value and will eventually be recemented into a solid mass. Concrete dams 3 ft. thick were set at 250 ft. intervals to prevent wash by undertow during hurricanes. The first 800 ft., where sand overlies the rock, was constructed inside a steel cofferdam from a temporary trestle. For the outer 6200 ft. the trench was excavated with a ladder dredge, which removed much of the rock without blasting; concrete blocks were set in it to grade, and 3-length sections of pipe were lowered to place and joined to previous section by divers. A test for tightness on completion of pipe laying showed no leakage at all. Ocean currents carry sewage from the outfall eastward to the gulf stream; diffusion is very rapid. Samples of water from various places near shore show positively no signs of sewage contamination.[Y1]

The New Treatment Plant of Atlanta, Ga.

THE CLAYTON plant of Atlanta, Ga., just going into service, takes the place of the abandoned Peachtree Creek and Proctor plants and serves also additional territory, the total present contributing population being 230,000; design capacity, 42 mgd dry-weather flow, 90 mgd storm flow (from combined sewers), surplus overflowing to river. River studies indicated that with present population a flow of 720 sec. ft. would make sedimentation alone sufficient, 930 sec. ft. with the 1950 estimated population, 1240 sec. ft. in 1970; 720 sec. ft. obtaining about 96% of the year. At lower flow, chlorination and chemical precipitation can be used.

Plant contains bar screens, screenings washed through comminutors; screens cleaned by float control and on a time cycle. Grit collected, washed and removed to trucks by bucket elevator. Two spiral-flow aeration and mixing basins, 15 min. detention, with flash mixing for chemicals if used, for odor control and grease removal. Four clarifiers, 2 hr. detention, with sludge scrapers and skimmers. Four 2-stage digesters give 1.65 ft. storage per capita, the two primary tanks heated and having turbo stirrers, the two secondary not heated and with floating gas holders. Elutriation, called for in plans, omitted temporarily from construction. Lime and chlorinated copperas mixed with sludge in air-agitated mixing tank, rate of feed of chemicals controlled automatically by sludge elevator. Sludge dewatered on two 8 x 8 ft. vacuum filters, cake carried by belt conveyor to trucks or storage bins. Two 180 hp. engines using sludge gas furnish more power than is needed for operation; gas heaters heat digesters, building and copperas solution tanks. Ventilation suction fans connect through ducts to screen building, covered grit chambers, covered aeration basin, digester control room, sludge pump room, sludge filter room, heater room and fume hoods in laboratory, ventilating all into a stack. A 15,500 cfm fan exhausts air from chlorine rooms and passes it through 2 banks of water sprays. Cost $830,000, PWA contributing 45%.[G23]

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Screenings Trituration Proves Advantageous

PRIOR to July, 1937, Oneonta, N. Y., buried screenings at a cost of $813 a year, including operator's time (about 2 hrs. a day). Since then screenings have been macerated and returned to sewage, and cost, including 10% depreciation, power, water, etc., has been $375 a year. Besides money saving, the method is more sanitary, and gas production is increased more than 50%.[G24]

Bibliography of Sewerage Literature

The articles in each magaine are numbered continously throughout the year, beginning with our January issue.

c. Indicates construction article; *n*, note or short article; *p*, paper before a society (complete or abstract); *t*, technical article.

D *The Surveyor*
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39. Excavations by the Wellpoint System. Pp. 707-708.
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40. *p.* Enclosed Aerated Filter. By J. Hurley and M. E. D. Windridge. P. 723.
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41. Enclosed Aerated Filters: Discussion. Pp. 835-838.

E *Engineering News-Record*
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13. Seven Million for Sewage Disposal. (Atlanta, Ga.) Pp. 741-744.
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14. Steam Sterilized Garbage Cans. Pp. 788-789.
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15. Green Bay Ends Sewage Pollution. J. Donohue. Pp. 815-818.
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16. Power from Refuse Incinerators. By F. C. Holbrook. Pp. 846-848.
17. Lansing Pioneers in Garbage Disposal. PP. 878-880.

G *Water Works & Sewerage*
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23. The Clayton Sewage Treatment Plant of Atlanta. By M. T. Singleton. Pp. 607-612.
24. Trituration of Sewage Screenings. By W. W. Watkins. Pp. 622-624.

H *Municipal Sanitation*
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45. Sludge Gas Engines Supply Power to Toledo Sewage Plant. By A. H. Niles. PP. 294-297, 302.
46. New Experiments in Ferric Chloride Generation. By C. D. Yaffe. Pp. 298-299, 308.
47. Incineration of Municipal Refuse. By H. W. Taylor. Pp. 300-302.

J *American City*
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18. One Year of Garbage Grinding (St. Lous). By F. J. McDevitt. Pp. 43-46.

K *Proceedings, Am. Soc. of Civil Engineers*
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11. Relation of Rainfall and Runoff to Cost of Sewers. By J. A. Rousculp. Pp. 1151-1165.

P *Public Works*
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22. Recent Work at the Lawrence Experiment Station. P. 16.
23. Building Trunk Sewers and Sewage Treatment Plant (Massillon, O.) By C. E. Rice. Pp. 21-24.
24. Recommended Operation of Sludge Digestion Tanks. P. 25.
25. Sewage Treatment for Greater Winnipeg. Pp. 32-33.
26. Separation of Solids from Liquids in Sewage Treatment. By S. I. Zack. Pp. 11-13.

Q *U. S. Piper*
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1. Cast Iron Pipe for Sewage Disposal Plant at Beverly, N. J. Pp. 30-32.

Y *Pipe Progress*
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1. Force Main and Outfall into Ocean at Miami Beach, Fla. By M. N. Lipp. Pp. 6-11.

Unauthorized Act of City Official

The street commissioner of a city in Missouri purchased chats, gravel and boulders from the land of a private owner for use on city streets and for other projects being performed by federal agencies CWA and FERA. No ordinances or resolutions were passed by the city authorizing the mayor to contract with the government agencies doing the work. The Springfield (Mo.) Court of Appeals held (Lively v. Webb City, 106 S. W. (2d) 517), that the city was not liable for the chats and boulders, although the commissioner's act may have amounted to a conversion.

Maintenance Bond Provision

The Texas Court of Civil Appeals held (Gray v. Kirk, 106 S.W. (2d) 840), that a paving contractor's contract to furnish a five-year maintenance bond for repairs necessitated by poor material or workmanship did not invalidate a paving assessment certificate of the city of Floydada levied on the lots on the theory that the requirement increased the cost of the pavement to the property owner. While there are some decisions to the contrary, in Texas it is held that the provision is merely a guarantee of the quality of the work and not a contract to maintain the pavement for the period stated.

Injury Caused by Machinery

A road construction company bought from a machinery company on conditional sales agreement a concrete mixer. By arrangement the machinery company sent an employee to operate the mixer until some employee of the construction company could familiarize himself with it. While being so operated, an employee of the construction company was injured while emptying a scoop attached to the mixer. In an action against the machinery company, alleging negligence of the operator as the general employee of the defendant, the New Jersey Court of Erros and Appeals held (Decker v. Ransome Concrete Machinery Co., 191 Alt. 755), that at the time of the injury the operator was under the direction and control of the construction company and a fellow servant of plaintiff, barring recovery from the machinery company.

Liability for Road Obstruction

The Tennessee Supreme Court holds (Tyler v. Obion County, 106 S. W. (2d) 548), that members of a county road commission are not liable in their official capacity for the death of a motorist striking a pile of gravel left in the highway, without lights or warnings, for use in making repairs. But they and the highway supervisor might, it was held, be liable in their individual capacity, since they owed the active duty to the public to see that the statutory mandates, which require the roads to be kept clear of obstruction and maintained in suitable condition for travel as far as possible, are observed.

With the New Improved Reinforced **ATLANTIC PNEUMATIC ROCK BREAKER!**

NO PLUGS AND FEATHERS NO EXPLOSIVES

Splits rock fast. Uses your air equipment. Cuts rock handling costs. No tool upkeep. Nearly 4½ times faster than using feathers and wedges. Fool-proof. Tougher than any stone. Amazing performance. First cost is last. Get this new tool for that next job.

ATLANTIC STEEL COMPANY
1775 BROADWAY
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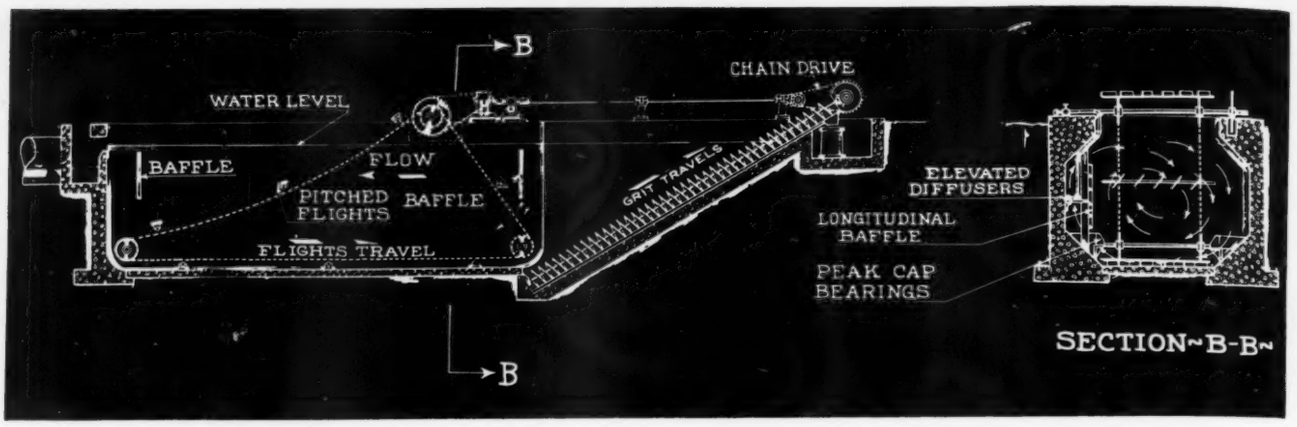


STRAIGHTLINE

GRIT COLLECTOR AND WASHER

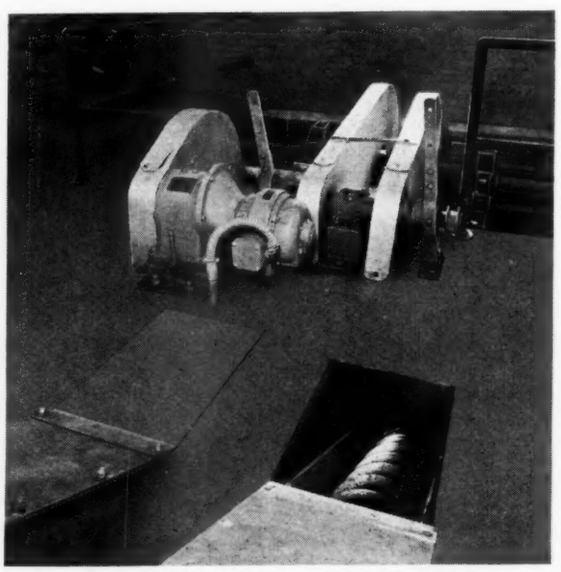
Keeping settling tanks free of sand and grit is effectively and economically accomplished with Link-Belt STRAIGHTLINE Grit Collectors and Washers.

The collectors carry the settled grit and heavy organic matter to inclined screw washers. The organic material is separated from the sand and grit by this washer. Let us send you further information.

Link-Belt Company, Philadelphia, Chicago, Los Angeles, Toronto, or any of our other offices, located in principal cities.

Link-Belt Equipment Includes:

Bar Screens . . . Tritor Screens . . . Scum Breakers for Digestion Tanks . . . Grit Collectors and Washers . . . Fine Screens . . . Mixing Equipment . . . STRAIGHTLINE Collectors . . . CIRCULINE Collectors . . . Volumetric Control for Sewage and Sludge Pumps.



Link-Belt STRAIGHTLINE *Grit Collectors and Washers at the Danville, Ill. Sewage Treatment Plant. Link-Belt Mixers and two* CIRCULINE *Collectors are also used. Greely & Hansen, Consulting Engineers.*

7431

LINK-BELT

SCREENS ▲ COLLECTORS ▲ AERATORS ▲ GRIT CHAMBERS ▲ DIFFUSERS

When you need special information—consult the *classified* READERS' SERVICE DEPT., pages 55-57

Keeping Up With New Equipment

Flocculator-Clarifier Unit for Single Tanks

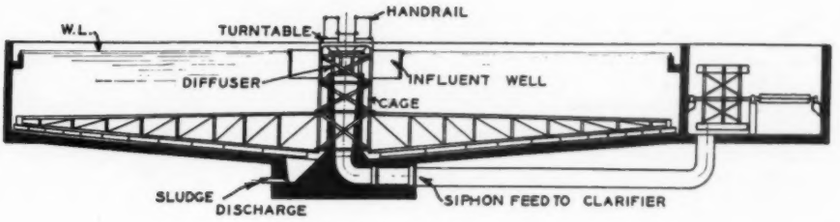
A new unit for performing in a single tank the two basic steps of pre-flocculation and sedimentation is announced by the Dorr Company. This is secured by combining the Dorrco flocculator with an advanced design of square sedimentation unit designated as the Dorr "Squarex" clarifier. This combination unit is applicable to sewage, water and trade waste treatment.

Many arrangements and combinations of the clarifier and flucculator are possible. In each arrangement the floccuators are basically the same Dorr mechanism that has been installed in individual units at water, trade waste and sewage treatment plants. Actual operating data from these installations show that their initial cost has been quickly repaid through savings of treatment chemicals through increased filter rates and decreased wash water and blowdown. In addition, pre-flocculation increases sedimentation rates. As an illustration, the results at Cedar Rapids, Iowa, sewage plant showed that pre-flocculation of raw sewage in a Dorrco flocculator, without chemicals, doubled clarifier capacity.

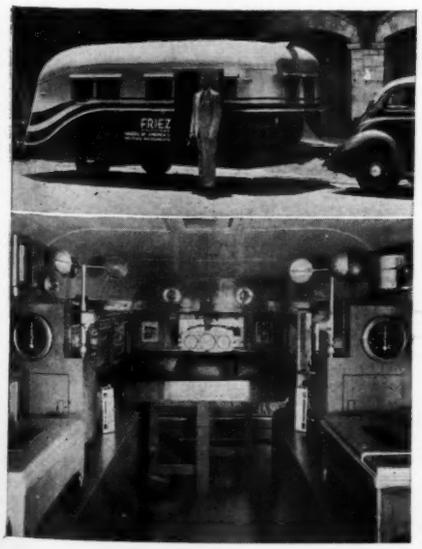
Following flocculation, sedimentation takes place in the Dorr Squarex clarifier. As its name implies, the Squarex has been designed especially for installation in square tanks and has a special mechanism for sweeping the entire floor area of the square tank.

Usually raw water, sewage or trade waste requires a short, preliminary period of high velocity mixing to effect a complete diffusion of the treatment chemicals before flocculation. Where this is the case, a Dorrco Flash Mixer may be installed in a flash mixing chamber ahead of the flocculators.

The Squarex clarifiers are furnished in standard sizes from 20′ to 100′ square. The size of the flocculator compartment will be determined in each case by the detention period required for the water, sewage or waste under treatment. Where flocculator-clarifier units in excess of the standard sizes are required, special plans will be developed.



Section of Dorr flocculator-clarifier



Outside and inside views of Friez Weathervan

The Freiz Weathervan

Julien P. Friez & Sons, Inc., Baltimore, Md., has equipped a "weathervan" with its many various types of weather instruments to further disseminate knowledge of the weather and modern methods of analyzing it. The Weathervan will visit research centers interested in gathering climatological data for:

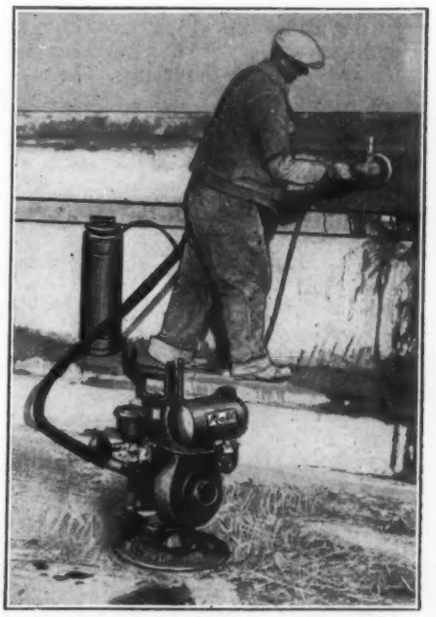
Soil conservation, including all the ramifications of rainfall, run-off and water table; agriculture and agronomy, where weather affects the propagation and culture of crops; flood control, requiring long-term rainfall and streamflow records for adequate prediction and protection against floods to come; forestry, where temperature, humidity, and wind are vital factors in forest fire protection; transportation, particularly air transportation, where current accurate weather reports are a paramount safety measure; process control industries, where outdoor weather is somewhat less important than indoor air-conditions, the recording and controlling of which are a major application of Friez instruments; municipal and state engineering, including waterworks and sewerage disposal plants, airport operation, and air-conditioned building maintenance.

The schedule of the Weathervan will eventually include every nook and cranny of the United States where weather is being studied. Accompanying it will be a representative thoroughly conversant with current weather instrument problems.

Foretelling daily weather is such a huge problem—involving high-low pressure areas, cold fronts and other technical data, that the average person is willing to accept it as uncontrollable and to a large extent unpredictable. Scientists, however, are continually and ceaselessly laboring to make our daily weather absolutely predictable — despite a subject shrouded in mythology, almanacs and factious remarks—and have made remarkable progress in the past few years. This progress is based on actual day by day records, daily weather maps, excursions by specially equipped planes (or newer radio transmitting devices) into the upper air lanes, all of which form the statistical basis for absolute weather prediction.

New Lightweight Gas Engine

The Mall Tool Company, 7740 South Chicago Avenue, Illinois, announces a new lightweight gas engine unit for the construction field. It has a wide range of utility and is recommended for all kinds of construction work such as drilling,



Mall lightweight gas engine

sanding, wire brushing, concrete surfacing and finishing, grinding and sharpening tools and bits.

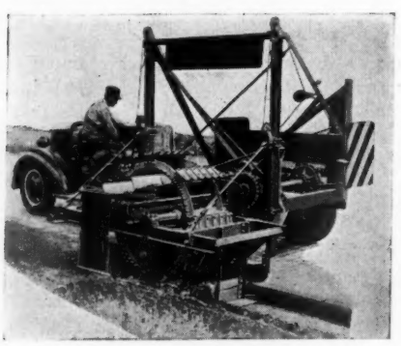
It has unusual portability. It can be picked up and carried by one man easily, carried up a ladder and placed on the ladder shelf or a stage. When necessary it can be suspended from a rope or hook.

This new gas engine unit operates independently of air compressors or generator sets. The power is transmitted from the single cylinder four-cycle air-cooled gas engine to the working tool by means of heavy duty flexible shafting. Where electric power is not available, this new unit will do dozens of jobs which otherwise would require tedious hand methods.

Highway Widening Machine

The Buckeye Traction Ditcher Company, Findlay, Ohio, has developed a highway widening machine designed to dig along the edge of the present road a subgrade trench of uniform width and depth at a speed geared to the other modern equipment used on the job.

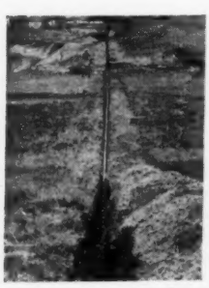
This machine leaves subgrades undisturbed, true to grade, clean and ready to receive material. The digging wheel assembly is so mounted that it may be swung around to position in back of the



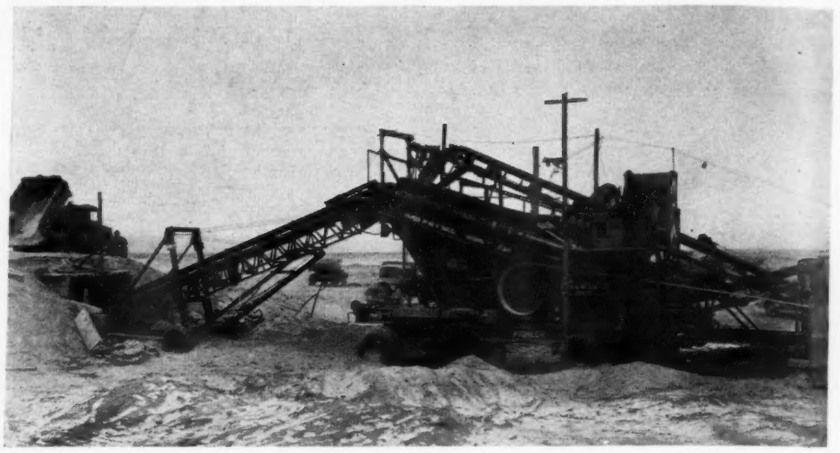
Buckeye highway widener

machine, thus bringing the overall width of the machine well within the maximum width allowable for transportation in states having such limitations. The machine moves from one job to another at regular truck speed and is handled like any standard truck.

For digging, the operator's seat swings around so that the operator has an unobstructed view of the excavating mechanism as well as the roadway ahead. Controls are banked within easy reach. It is built in two sizes—the lighter model digging trench 12″ to 27″ wide and the heavy duty model 12″ to 48″ wide.



This 1600-ft. pipe line was installed in 2½ days by WPA workers at Topeka, Kans. Pipe is Armco, 6-inch, welded. It carries sewage waste from a bath house on one side of Lake Shawnee to a disposal plant on the other side.



Pioneer 48-V duplex crushing plant

Pioneer Duplex Crushing Plant

The new 48-V Pioneer duplex crushing plant is the largest plant in the field today — 4′ x 12′ inclined vibrating screen; 1036 SKF-bearing jaw crusher; and 40″ x 22″ Timken bearing roll crusher. New features on this plant include:

The angle of the screen has been lowered to 18 degrees and the direction of the rotation is with the flow of material; an overhead swivel drive lowers the height of the feeder conveyor and feeds the material directly onto the screen; a 3½ deck screen; the ½ deck had been added so that sand can be rejected without sacrificing screen area for the finished product; new clutches; and the by-pass can now be furnished on vibrator plants to by-pass small rocks around the jaw crusher and directly to the roll crusher.

Complete catalog on request to Pioneer Engineering Works, Inc., Minneapolis, Minn.

Largest Heavy-Duty Truck Tire

A 30-ply tire, 24.00-32 size, weighing 1200 pounds has been built by Goodyear Tire & Rubber Co., for a manufacturer of earth-moving vehicles. When inflated to 75 pounds, it will have a load capacity of 25,000 pounds; the outside diameter is 82 ins., rim diameter 32 ins., and cross-section 25 ins. Quite a tire. Reminds us of the days when we all figured pneumatics were fine for hauling eggs, but the good old solid tire was all right for tough stuff like dirt and stone.

Asbestos-Cement Pipe Plant

A new type of asbestos-cement pipe will be manufactured in a plant now nearing completion at Ambler, Pa., by Keasbey & Mattison Co. This plant will have a capacity of 9000 tons a year, and another plant under construction in St. Louis will produce 6000 tons a year. The pipe will be manufactured under the Dalmine process, in sizes from 2 to 24 ins. in diameter.

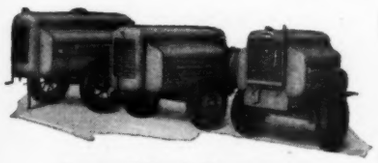
The Lima Paymaster Shovel

Lima Locomotive Works, Inc., Shovel and Crane Division, Lima, Ohio, announces a new convertible shovel, dragline, crane and pull-shovel known as the "Paymaster." This was the name given to the new machine by virtue of a contest conducted at the 1938 Road Show. It is a ¾ yard shovel weighing 35,500 lbs. When equipped as a clamshell or dragline, capacity depends upon length of boom and material to be handled. When equipped as a crane, it has an 11-ton capacity. As a shovel it is equipped with an 18′-0″ boom and 15′-0″ dipper handle. Standard crane boom is 35′; inserts can be added to make a 50′-0″ boom.

The new Lima Paymaster ¾-yard shovel

Light-Weight Portable Air Compressors

Three new compressors have been brought out by Ingersoll-Rand, Phillipsburg, N. J. These range from a 55-ft. compressor, just big enough to operate a small hammer or a paving breaker,

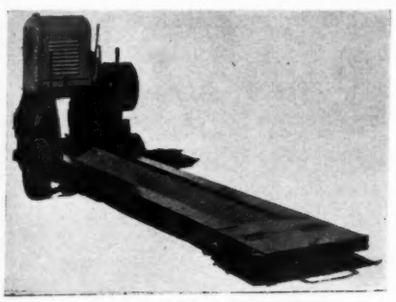


Ingersoll-Rand Compressors

through the 85-ft. to the 105-ft. machine, which will operate the largest dry jackhammer or three paving breakers. All these are built for fast trailing, have hinged covers and built-in tool boxes. Fuller information in Bulletin 3264.

Car Unloader and Conveyor

Atlas Conveyor Co., Clintonville, Wisc, has a new car unloader especially adapted to unloading cars of sand, stone or gravel. It can be laid across the tracks,



Atlas Unloader and Conveyor

so that digging into the ballast is not necessary. It will handle 50 to 70 cubic yards per hour. Can be furnished with either electric motor or 5 hp. gasoline engine.

Kem Metal Protective Paints

Sherwin-Williams Co., Cleveland, O., announce S-W Kem-Metal protective paints and include Kem-Kromik metal primer, Kem-Elastic metal protective paints and Kem red lead (primer).

The distinguishing feature in the formulating of these new products is said to be their chemically evolved (synthetic) S-W Kem Liquid. The advantages claimed for these paints are: More complete exclusion of water and gases from the metal protected; durability; improved appearance.

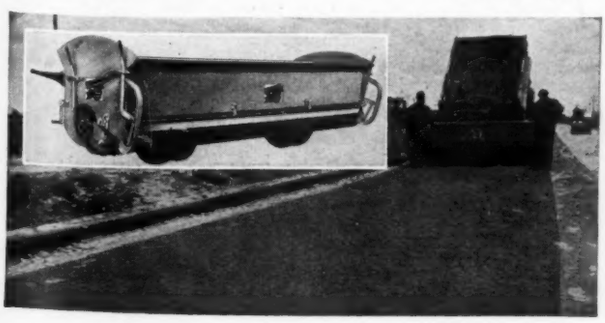
Four FWD M-10 trucks have been purchased by Westchester Co., N. Y. Now used to haul rock produced in N. Y. City aqueduct construction for road work. 8-yd. body. Note high lift hoist. Kensico dam in background.

Byers ¾-Yard Shovel

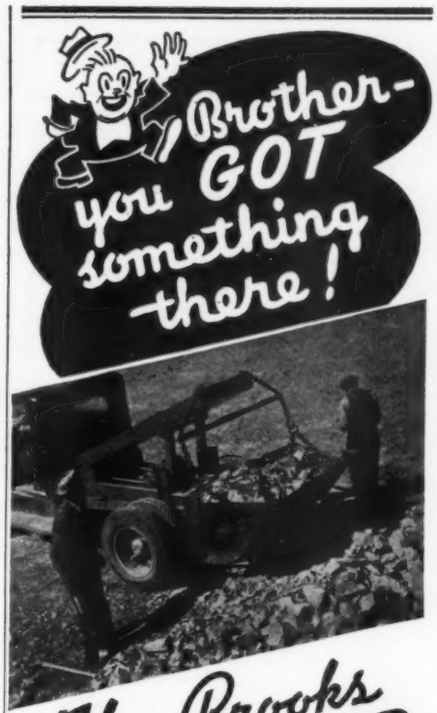
Byers Machine Co., Ravenna, O., have a new ¾-yard shovel that weighs 36,000 pounds, the Model 83. The description as received is most too technical for translation, so for that we refer you to the manufacturers. However, it appears that the number of digging

New-Byers ¾-yd. Shovel

cycles per minute are high, plenty of power has been provided, ground bearing pressures have been reduced by lighter overall weight, and the power may be either gasoline or diesel. Crawler treads are 20 ins. wide. For the really technical dope, write E. T. Geddes of the company.



The Buckeye surface material spreader controls the amount of material through a feed roll, which has an agitator to insure full width distribution. 6 pp. folder shows how it works. Buckeye Traction Ditcher Co., Findlay, O.



The Brooks LOAD LUGGER

PATENTED & PATENTS PENDING

With every showing of the Brooks Load-Lugger the response is always the same . . . "Brother — you G O T something there." And we have. Wherever loading is done by hand, one Load-Lugger and 5 to 10 Load-Lugger buckets may replace an equal number of trucks. In quarries; sewerage; road construction; excavating and many other types of service, the amazing possibilities of the Brooks Load-Lugger in cutting hauling and dumping costs is almost unbelievable. The Load-Lugger is ONE MAN operated from driver's seat. Dumps automatically. Can be installed on any truck chassis in a few hours, and its low cost will surprise you.

DAY
Crushers
and
Pulverizers

You can't go wrong in a DAY . . . manufactured continuously since 1914. Designed for long hard service. Sold internationally. Capacities up to 50 tons per hour . . . on skids or mounted, with or without elevators. Day Swing Hammer Crushers or Pulverizers are ideal for reducing man size stone to one-half inch and under for maintenance purposes. Dealers in principal cities.

BROOKS EQUIPMENT & MFG. CO.,
36 DAVENPORT ROAD, KNOXVILLE, TENN.

PERSONAL NEWS

Harry E. Jordan, secretary of the American Water Works Association, received the honorary degree of Doctor of Science at the 102nd commencement ceremony of Franklin College. After graduation as Bachelor of Science from Franklin in 1903, he was associated with the Indianapolis Water Company for thirty-three years except for the World War period, when he served in the Construction Division of the Army.

Elson T. Killam of New York City has been appointed consulting engineer by the Florida Keys Aqueduct Commission, following the acceptance of his preliminary report as to methods of furnishing a water supply to the City of Key West and the Florida Keys Aqueduct District. Plans and specifications for the completion of this work are now in progress.

A. S. Lowe, head of the Sanitary Engineering Department, Dorr-Oliver, Ltd., is in this country to study sewage treatment practices; Arthur Terry, managing director of Dorr-Oliver N. V., The Hague, has returned to Holland after a visit in the United States.

George D. Shaeffer has been appointed chief engineer of the Road Machinery Division of Gar Wood Industries, Detroit, Mich.

F. F. Staniford has been elected president of Mack-International Truck Corp., and R. D. Hilty, vice-president.

Howard V. Smith of El Dorado, Kans., for the past 11 years superintendent of the Skelly refinery at that place, has been made chief chemical engineer of the Barber Asphalt Corp., and in charge of that company's technical department. J. Strother Miller, Jr., formerly in charge of the technical department, has been advanced to be technical adviser.

Koppers Co., Western Gas Division, Fort Wayne, Ind., has acquired exclusive rights to the manufacture and sale of the line of valves and other waterworks and sewage equipment formerly produced by Michigan Valve & Foundry Division of Timken-Detroit Axle Co.

Frank E. Aurand, Jr., formerly associated with the Concrete Surfacing Machinery Co., Cincinnati, O., has purchased the Berg Cleaning Tool Division, and has formed the Aurand Mfg. & Equipment Co., 2643 Colerain Ave., Cincinnati, Ohio, which will carry on this business.

SENT ON REQUEST

Universal Crusher Co., Cedar Rapids, Ia., has issued four bulletins: No. 14 on the 180-Q portable single crusher quarry plants; No. 28 on the 248-Q dual crusher plants; No. 34 on the 66-G portable single crusher gravel plant; and No. 37 on the 199-G single crusher gravel plant.

Chain Belt Co., Milwaukee, Wisc., has issued Bulletin 322, which describes and illustrates the complete line of Chain Belt construction equipment.

Caterpillar Tractor Co., Peoria, Ill., has issued a pictorial "Earth Moving Booklet" on airports, road construction and maintenance, and gravel construction.

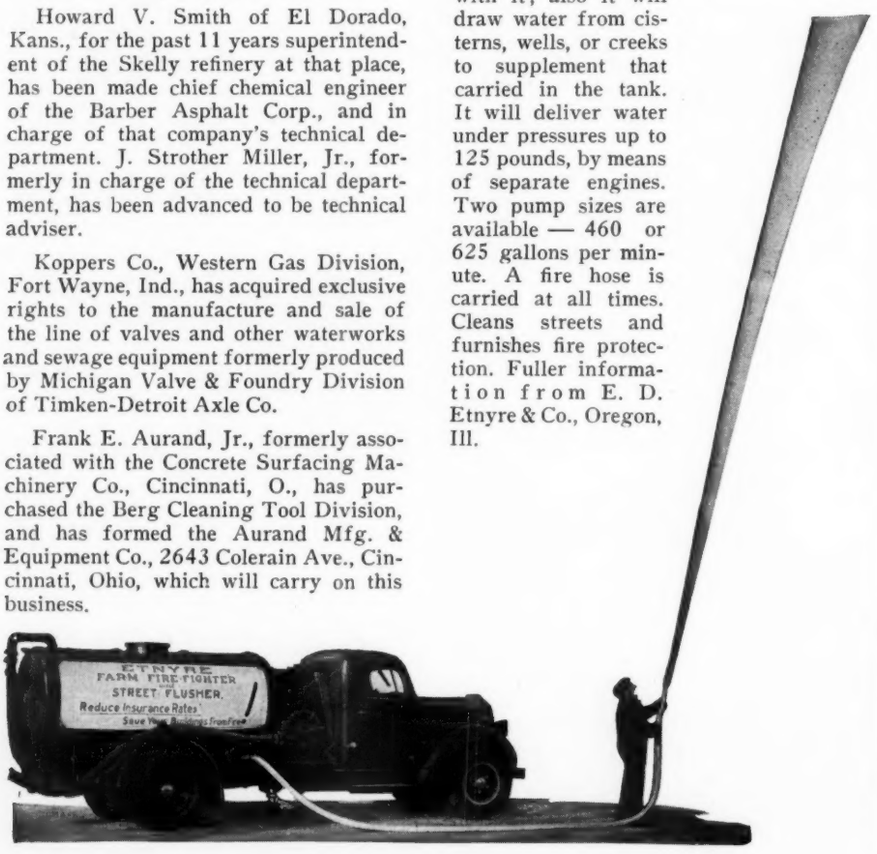
New Jersey Section, AWWA

The next meeting of this section will be held at the Berkeley-Carteret Hotel, Asbury Park, N. J., October 21 and 22. H. N. Lendall, Rutgers University, New Brunswick, N. J., is secretary-treasurer.

Street Flusher and Farm Fire Fighter

This unit is especially designed for small communities. It will flush and clean streets, but it is also a highly mobile fire-fighting unit that carries its water supply with it. It is therefore particularly valuable for fighting fires where a water supply is not immediately available.

It carries up to 3,000 gallons of water with it; also it will draw water from cisterns, wells, or creeks to supplement that carried in the tank. It will deliver water under pressures up to 125 pounds, by means of separate engines. Two pump sizes are available — 460 or 625 gallons per minute. A fire hose is carried at all times. Cleans streets and furnishes fire protection. Fuller information from E. D. Etnyre & Co., Oregon, Ill.



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Readers' Service Department

These booklets are FREE to readers of PUBLIC WORKS.

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Feeders, Chlorine and Chemical

387. For chlorinating small water supplies, swimming pools and other installations. Flow of water controls dosage of chlorine (or other chemicals) providing required dosages, which are immediately adjustable. Driving is started and stopped automatically. Send for newest literature. %Proportioneers%, 9 Codding St., Providence, R. I.

Filter Plant Controllers

388. "The Modern Filter Plant" and the uses of Simplex Controllers for operation are described in a handy, 16-page booklet. Charts, data, curves and tables. Simplex Valve and Meter Co., 68th and Upland Sts., Philadelphia, Pa.

Flow Meters

389. The primary devices for flow measurement—the orifice, the pilot tube, the venturi meter and others—and the application to them of the Simplex meter are described in a useful 24-page booklet (42A). Simplex Valve and Meter Co., 68th and Upland Sts., Philadelphia, Pa.

Gate Valves and Hydrants

390. An 84-page catalog gives full design data, information about and illustrations of the complete line of Darling Gate Valves and Hydrants. Write for one to Darling Valve and Mfg. Co., Williamsport, Pa.

391. Two new bulletins on M-H fire hydrants and fully bronze mounted gate valves are now ready. Contain full specifications and instructions for ordering, installing, repairing, lengthening and using. Write M. & H. Valve & Fitting Co., Anniston, Ala.

392. 28 page catalog contains illustrations and complete specifications of M-H standard and extra heavy iron body gate valves, horizontal swing check valves, flanged fittings and flanges, etc. Sent promptly on request by M. & H. Valve & Fittings Co., Anniston, Ala.

Indicators, Rate of Flow

400. This rate of flow indicator is a new, simple, compact, ruggedly constructed instrument which indicates flow with great accuracy in filtration and softening. Described and illustrated in new bulletin issued by The Permutit Company, 330 West 42nd St., New York, N. Y.

Manhole Covers and Inlets

403. Nuisance from loose, noisy manhole covers is eliminated by the use of Westeel rubber cushioned manhole covers and gratings. Six special advantages are explained in a new illustrated bulletin just issued by the West Steel Casting Co., 805 East 70th St., Cleveland, Ohio.

404. Street, sewer and water castings made of wear-resisting chilled iron in various styles, sizes and weights. Manhole covers, water meter covers, adjustable curb inlets, gutter, crossing plates, valve and lamphole covers, ventilators, etc. Described in catalog issued by South Bend Foundry Co., South Bend, Ind.

Pipe, Cast Iron

406. Data on cast iron pipe for water works systems, in sizes from 1¼ to 84 inches, including information on useful life, flow data, dimensions, etc., Thos. F. Wolfe, Cast Iron Pipe Research Ass'n, 1013 Peoples Gas Bldg., Chicago, Ill.

Pipe, 2-inch Cast Iron

407. The new McWane 2" cast iron pipe in 18-foot lengths has innumerable uses in water and sewage work. Send for the new McWane bulletin describing this pipe, the various joints used, and other details about it. McWane Cast Iron Pipe Co., Birmingham, Ala.

Pipe, Large Cast Iron

408. Handy cast iron pipe and fittings catalog contains A.W.W.A. and A.G.I. standard specifications for a wide variety of cast iron pipe specialties, both bell and spigot and flanged; also dimensions Lynchburg Foundry Co., Lynchburg, Va.

409. Information on concrete pipe for sanitary or storm sewers which can be made anywhere by manufacturer using local labor and materials. Write Concrete Pipe Machinery Co., Sioux City, Iowa.

Pipe Forms

411. Making concrete pipe on the job to give employment at home is the subject of a new booklet just issued by Quinn Wire and Iron Works, 1621 Twelfth St., Boone, Ia., manufacturers of "Heavy Duty" Pipe Forms. Sent promptly on request.

Pipe Joining, Quick, Easy, Permanent

412. New 12-page catalog describes a line of products for making (1) permanently tight, simple, flexible connections on plain-end pipe, and (2) quick repairs to pipe and pipe joints in a few moment's time, without service interruptions. Only tool needed is wrench. Unskilled labor does the work. Write S. R. Dresser Mfg. Co., Bradford, Pa.

Taste and Odor Control

417. How, when, and where activated carbon can and should be used to remove all kinds of tastes and odors from water supplies is told in a new booklet just issued by Industrial Chemical Sales Div., 230 Park Ave., New York, N. Y. 32 pages, table, illustrations and usable data.

Pumps and Well Water Systems

420. Installation views and sectional scenes on Layne Vertical Centrifugal and Vertical Turbine Pumps, fully illustrated and including useful engineering data section. Layne Shutter Screens for Gravel Wall Wells. Write for these three descriptive booklets. Layne & Bowler, Inc., Dept. W, General Office Memphis, Tenn.

Pumping Engines

424. "When Power Is Down," gives recommendations of models for standby services for all power requirements. Sterling Engine Company, Buffalo, N. Y.

Root-Proofing

425. Free sample of "Stop Root Ring" for root-proofing clay or concrete pipe without tools, and complete descriptive matter will be sent on request to A-B-C Mfg. Co., 227 So. 4th St., Quincy, Ill.

Run-off and Stream-Flow

426. Excellent booklet describes and illustrates the latest types of instruments for measuring run-off, both from small areas for storm sewer design, and from large areas for determining water shed yield. Sent promptly by Julien P. Friez & Sons, Baltimore, Md.

Screens, Sewage

428. Be assured of uninterrupted, constant automatic removal of screenings. Folder 1587 tells how. Gives some of the outstanding advantages of "Straightline Bar Screens" (Vertical and Inclined types). Link-Belt Co., 307 N. Michigan Avenue, Chicago, Ill.

Setting and Testing Equipment for Water Meters

430. All about setting and testing equipment for Water Meters—a beautifully printed and illustrated 40 page booklet giving full details concerning Ford setting and testing apparatus for all climates. Ford Meter Box Co., Wabash, Ind.

Rainfall Measurement

432. The measurement of precipitation, exposure of gauges, description of apparatus for measuring rainfall, both rates and amounts. Bulletin RG and Instruction Booklet. Julien P. Friez & Sons, Baltimore, Md.

Screens

435. Water Screen Book No. 1252, describes traveling water intake screens and gives complete technical information about them. Link-Belt Co., 307 No. Michigan Ave., Chicago, Ill.

Sewage Filters, Magnetite

436. Well illustrated booklet describes the magnetite filter, and tells how it is used in the treatment of Sewage. Copy on request from Filtration Equipment Corp., 10 East 40th St., New York, N. Y.

Small Septic Tanks

438. Septic Disposal Systems, Waterless Toilets, Multiple Toilets for Camps and Resorts, and other products for providing safer sewage disposal for unsewered areas are described and illustrated in data sheets issued by San-Equip, Inc., 700 Brighton Ave., Syracuse, N. Y.

Sludge Incineration

440. Disposal of Municipal Refuse: Planning a disposal system; specifications. The production of refuse, weights, volume, characteristics. Fuel requirements for incineration. Suggestions for plant inspection, 45 pp., ill. Also detailed outline of factors involved in preparation of plans and specifications. Morse-Boulger Destructor Co., 202P East 44th St., N. Y.

Swimming Pool Equipment

444. A new booklet "Essential Factors in the Design and Layout of Swimming Pool Systems," with data on filtration equipment, fittings, solution feeders, accessories, etc., is available from Everson Manufacturing Co., 213 West Huron St., Chicago, Ill.

445. Data and complete information on swimming pool filters and recirculation plants; also on water filters and filtration equipment. For data, prices, plans, etc., write Roberts Filter Mfg. Co., 640 Columbia Ave., Darby, Pa.

446. 40-page Manual on swimming pools. Includes swimming pool layouts, specifications, etc., and details concerning Permutit Swimming Pool Equipment. Write The Permutit Co., Dept. G-4, 330 West 42 St., New York, N. Y.

Treatment

450. Standard Sewage Siphons for small disposal plants and PFT Rotary Distributors are new catalogs recently issued by Pacific Flush Tank Co., 4241 Ravenswood Ave., Chicago, Ill. The latter catalog contains typical plans and many illustrations of actual installations.

453. New booklet on Link-Belt Circuline Collectors for Settling Tanks contains excellent pictures and drawings of installations, sanitary engineering data and design details. Link-Belt Company, 307 North Michigan Ave., Chicago, Ill.

454. Full information regarding their newest equipment for sewage treatment and water purification will be sent on request by The Dorr Co., 570 Lexington Ave., New York, N. Y.

Water & Sewage Treatment Chemicals

500. Aluminum sulphate and ferric chloride for sewage coagulation, and these chemicals and ammonia, copper sulphate and others for water treatment. Information on uses and methods sent on request to General Chemical Co., 40 Rector St., New York, N. Y.

501. "Ferrisul for water and sewage treatment." What it is; what it will do for you and how to use it—a handy booklet issued by Merrimac Chemical Co., Everett Station, Boston, Mass.

Valve Box Tops

475. "Cut the Cost, but Not the Pavement," is the theme of a new bulletin on Rite-Hite Valve Box Tops. Gives directions for forming new tops on valve boxes, quickly and inexpensively without digging up the old box. Just issued by Trohn's Supplies, Inc., 205 Hoyt Ave., Mamaroneck, N. Y.

Water Works Operating Practices

490. "What Is New In Coagulation" is an excellent, new review with bibliography and outlines of latest work done in the field. Written by Burton W. Graham and sent free on request to Activated Alum Corp., Curtis Bay, Baltimore, Md.

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For the Engineer's Library

Brief reviews of the latest books, booklets and catalogs for the public works engineer.

Good Low Cost Roads:

Allis-Chalmers Mfg. Co., Tractor Division, Milwaukee, Wisc., has issued a 34-page booklet that gives a lot of information on types of low cost roads, costs per mile for construction and for maintenance and daily traffic limitations. Also construction data. Sent on request.

Sludge Drying & Incineration:

Dorr Co., 570 Lexington Ave., N. Y., has issued a 24-page booklet describing sludge drying and incineration by the C. E. Raymond system. Operation of the five basic steps of (1) sludge preparation, (2) flash drying, (3) incineration, (4) deodorization and (5) dust collecting are explained by a number of installation pictures and line drawings in which color is used to indicate the mechanism involved in each step. The system allows a choice of (1) incineration of all the sewage sludge, (2) flash-drying all sludge for use as a fertilizer, or, (3) incineration of part and flash-drying of the remainder.

Sewage Aerator:

This 24-page booklet describes the Dorrco paddle aerator and also the turbo-aerator. The first is a combined mechanical-diffused air type and the second a mechanical aerator. Also, contains a discussion of the activated sludge method of treatment, with much interesting data, drawings and illustrations of plants. At the end is a lot of "Useful Information" that most any engineer can use. Sent on request. Dorr Co., 570 Lexington Ave., N. Y.

Sewage Ejectors:

A 30-page bulletin has been issued by Chicago Pump Co., 2336 Wolfram St., Chicago, Ill., which gives a lot of information on municipal sewage pumping installations. The data in this bulletin, and the installation pictures may come in very handy. Installation drawings and specifications add to the completeness.

The Story of Koppers:

This is an excellently prepared and illustrated, and also interesting, booklet on the growth of the Koppers Co. over the past 24 years. Pictures and charts are combined to make a most readable annual report. Koppers Co., Pittsburgh, Pa.

Coagulation:

A mimeographed paper on "Imporant Factors in Coagulation" by Burton W. Graham is being sent on request to Activated Alum Corp., Baltimore, Md. There is a lot of excellent information on the coagulation process, including a resume of factors in control. Sent on request.

Well Screens:

Catalog 538, E. E. Johnson, Inc., St. Paul, Minn., 32 pp. Describes screens and their uses, and also illustrates and explains methods of installing; bailing or washing; recovering; developing sand and gravel wells with surge plungers; developing with compressed air; and gravel packed wells, both ordinary and stabilized. Also circular and standard weirs for measurement, and other data. Excellent.

America Spreads Her Wings:

This beautiful booklet is intended to give the reader an insight into the magnitude of airport development under the Federal works program. Development of the industry is shown graphically; placing air markers; building superterminals, major airports and landing fields. Typical examples of the work done are shown. Also a financial and statistical summary. Worth asking for. We believe it will be sent on request to Works Progress Administration, Information Service, Washington, D. C.

Sewage Treatment:

The 11th Annual Report of the Ohio Conference on Sewage Treatment, covering papers presented at the meeting in Columbus in October, 1937, has been published. It contains a number of excellent papers and discussions. 99 pages. For sale by F. E. Harroun, Treasurer, 501 Municipal Bldg., Akron, O. $1.25.

Swimming Pools:

An 8-page bulletin gives sound information on the general design of purification systems for swimming pools, along with some sketches and drawings and excellent installation photographs. Ask for Bulletin SP1, E. W. Bacharach & Co., Kansas City, Mo.

Roads, Canals and Embankments:

180 pages; illustrated. Written by F. A. Nikirk of the Caterpillar Tractor Co., Peoria, Ill. There are 51 pages on road construction, including clearing, grading, end haul, bull-dozers and trail-builders, scraper performance and compacting fills; 25 pages on paving and road surfacing; 27 pages on road maintenance, including drainage, weed control, earth and gravel surfaces, stabilized, and bituminous surfaces; auto patrol as a maintenance machine; winter work; also data on building canals with blade graders and with elevating graders; canal maintenance; embankments; terracing; and selection of equipment. Order from Caterpillar Tractor; 50c.